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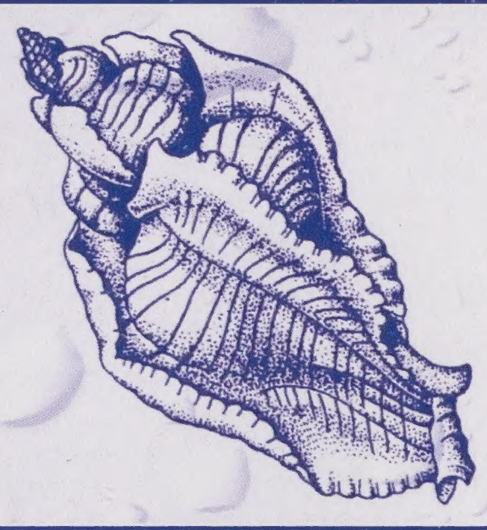

THE Festivus

Vol. 55(4) November 2023

Textilia from the Marquesas Islands

A new *Fenimorea* from the Eastern Gulf of Mexico

Interesting new Gastropods from the Gulf of Mexico

A review of the *Relegamoria molleri* species complex

Quarterly Publication of the San Diego Shell Club

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Volume: 55 November 2023 ISSUE 4

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FRONT COVER:

Textilia minamiae Lum, new species, live collected at Taiohae Bay, Nuku Hiva, Marquesas Islands, photographed by David Lum. (Cover artistic credit: Rex Stilwill).

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A New Species of *Textilia* from the Marquesas Islands

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ABSTRACT This paper describes a new Conidae species, *Textilia minamiae*, from the Marquesas Islands, French Polynesia. The new species is most closely related to *Textilia bullatus* (Linnaeus, 1758) and *Textilia pongo* (Coomans, Moolenbeek & Wils, 1982). The author compares multiple morphological characteristics to distinguish it from its congeners and provides observations on its biology.

KEY WORDS Conidae, *Textilia*, *Textilia minamiae,* Marquesas Islands (Archipelago), French Polynesia, South Equatorial Current

INTRODUCTION

The extreme isolation of the Marquesas Archipelago caused by its remoteness from other land masses and by oceanographic conditions dominated by the powerful, westward flowing South Equatorial Current has produced an exceptionally high degree of endemism among its marine animals. It is estimated that at least 70% of the key tropical index mollusk families in the Marquesas have endemic species (Petuch & Berschauer, 2020), and over 22% of Conidae there are endemic (Touitou & Balleton, 2022). Given these parameters, close examination of animals resembling familiar, widely distributed Indo-Pacific species often yields new taxa. A new endemic Conidae species is presented here following a detailed study of a Marquesan gastropod historically viewed as a local variant of the widely distributed *Textilia bullatus*.

Abbreviations:

BPBM Bernice Pauahi Bishop Museum, Hawaii
DL David Lum
DW David Watts
HL Harry Lynch
HB Harry Bedell
JL Julian Lee
MB Marty Beals
PK Paul Kanner
WF William Fenzan

Material and Methods

Only mature, normally formed specimens were used for this study. A mature shell is defined as one where the outer lip has developed to the point that there is a zone of reduced patterning and coloration adjacent to the aperture. A total of 46 *T. minamiae* specimens from the Marquesas; 11 *T. bullatus* from the Hawaiian Islands and 47 more from various locations in the Western and Central Pacific (Ryukyu Islands, Philippines, Solomon Islands, and Indonesia, Samoa, Marshall Islands, and Federated States of Micronesia); and two *T. pongo* from the Indian Ocean were utilized for comparison of morphological characteristics and measurements. Dimensional measurements are enumerated in millimeters (mm). Weight is measured in grams (g). Definition of terms and derived comparative indices are:

- Length of shell (maximum) = Lm
- Length of shell measured along central axis = L
- Length of shell measured along central axis from shoulder suture to anterior end = Lsh
- Length of spire = Lsp = L-Lsh
- Width of shell (maximum) = Wm
- Height of shell (measured from lip) = Hl

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- Weight = M
- Spire Length Index = SI = (100*Lsp) / L. Lower SI indicates a shell with a shorter spire relative to the length of the shell as measured along the same axis as the spire. The "100" is a scaling factor to ease comparison.
- Tumidity Index = TI = (Wm*Hl) / Lm. Higher TI indicates a more tumid (inflated) shell.
- Weight Index = MI = (1000*M) / (Lm*Wm*Hl). Higher MI indicates a heavier shell relative to volume. The "1000" is a scaling factor to ease comparison.

To adequately establish the uniqueness of *T. minamiae*, a relatively large group of this species was compared to a significant number of *T. bullatus* specimens sampled from multiple locations within its broad range in the Indo-Pacific. Few *T. pongo* specimens were available for comparative study, but this species is quite easily separated from its close relatives by its nondescript outer shell pattern and vermillion aperture. Plates 4-5 provide images of *T. bullatus* from various locations and *T. pongo* for comparison.

All photographs were taken with a Nikon digital single-lens reflex camera. Lens focal length was set at 50 mm or greater to minimize image distortion. Two fluorescent lamps or in-camera flash were used for lighting. In situ live animals were photographed with a handheld GoPro camera with underwater housing. Adobe Photoshop was utilized for minor image adjustments to improve color accuracy.

SYSTEMATICS

Phylum	Mollusca
Class	Gastropoda
Subclass	Sorbeoconcha
Order	Prosobranchia
Infraorder	Neogastropoda
Superfamily	Conoidea
Family	Conidae
Subfamily	Coninae
Genus	*Textilia* Swainson, 1840

Textilia minamiae Lum new species
(Figure 1, Plates 1-3)

Description. Coniform shell with broad shoulder and slightly ovate outlines that gradually tapers toward anterior end; noticeable angular transition occurs on body whorl approximately 1/4 of total length from posterior end of shell; spire sunken or very low profile at outer whorls, becoming projecting in vicinity of

Figure 1. Holotype of *Textilia minamiae* n. sp., La Sentinelle aux Marteaux, Taiohae Bay, Nuku Hiva, Marquesas Islands, 25 m. Lm 58.78 mm. Photos by D. Lum

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sharp, pink protoconch and early whorls; gently concave groove with two to three thin, spiraling ridges in space between sutures of spire that, in very mature specimens, results in flaring at posterior extreme of aperture; texture satiny with fine, raised crisscrossing longitudinal and transverse ridges; background shell color white and typically overlaid by mottling of various shades of ochre; pattern with 15 or more thin, well-organized bands of varying width composed of reddish-brown and lighter-colored dashes along entire length of body whorl; coarse blotches of reddish-brown, purple, or muted orange in zones from roughly 1/3 to 2/3 along length of shell; small white triangles and streaks dispersed throughout shell surface with increased concentration on ventral side; outer lip of mature shell less sharp and with zone of pale coloration and reduced pattern immediately above edge; aperture wide and greatly enlarged toward anterior; aperture color typically glossy white, occasionally gradating to faint pink or yellow toward shell interior and edge of lip; aperture rarely entirely pale orange; periostracum is very thin, smooth, tan-colored, and virtually transparent; operculum oval and vestigial with no apparent protective function.

Type Material. All specimens from Taiohae Bay, Nuku Hiva, Marquesas
(Type. LxWxHl, M / repository)
Holotype, 58.78x32.06x26.98, 17 / BPBM catalog # 296608
Paratype 1, 55.34x30.20x25.70, 17 / DL
Paratype 2, 61.68x34.57x28.98, 24 / DL
Paratype 3, 62.10x33.78x28.61, 28 / DL
Paratype 4, 60.00x33.04x28.19, 22 / DL
Paratype 5, 61.17x32.95x27.80, 21 / DL
Paratype 6, 68.65x37.88x31.58, 31 /MB
Paratype 7, 45.40x25.10x21.50, 15 / HB
Paratype 8, 57.62x30.77x26.44, 15 / PK
Paratype 9, 58.83x29.68x26.17, 19 / JL
Paratype 10, 49.40x26.80x22.70, 15 / HL
Paratype 11, 61.14x33.57x28.75, 21 / DW
Paratype 12, 65.55x36.16x30.03, 24 / MB

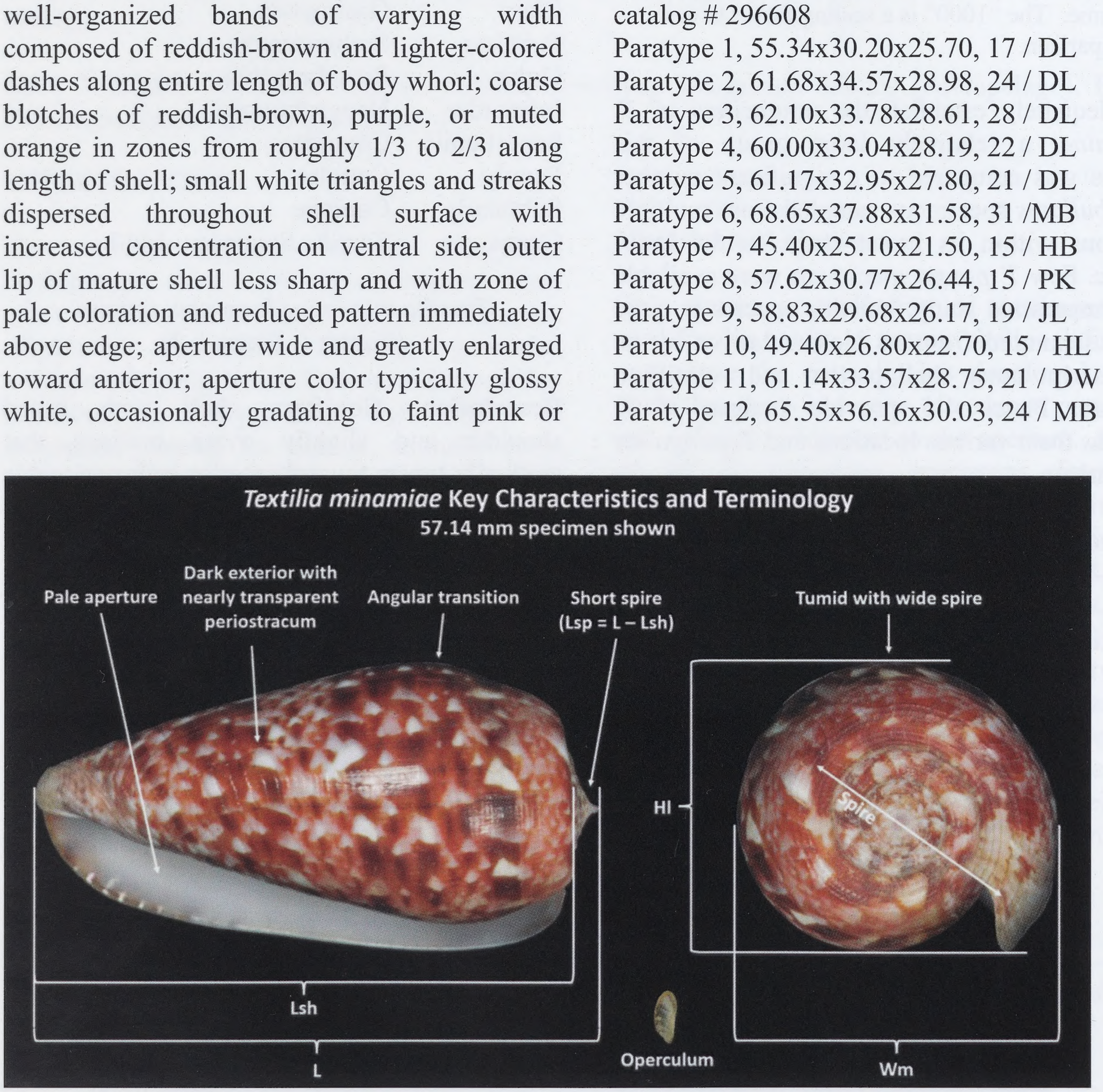

Figure 2. Images of Paratype 17 showing defining characteristics of *Textilia minamiae* and locations of morphometric measurements. Photo by D. Lum.

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Paratype 13, 64.86x32.86x29.20, 24 / JL
Paratype 14, 54.31x29.62x24.95, 18 / PK
Paratype 15, 62.80x34.10x29.10, 21 / HB
Paratype 16, 61.60x34.69x29.30, 21 / WF
Paratype 17, 57.14x31.06x26.60, 17 / DL

Other material examined include 28 additional paratypes located in the following collections (maximum length of each specimen in mm):
MB: 51.10, 58.94, 59.08,
HB: 48.1, 49.5, 52.0, 57.3, 57.4, 59.0
PK: 52.51
JL: 50.60, 50.97, 54.43, 56.22, 56.79, 57.67, 59.64, 63.05
DL: 52.64, 55.43, 56.06, 57.67, 59.07, 59.84, 59.87, 62.20
HL: 52.83
DW: 61.09

Animal Characteristics. Dorsal surface of foot with marbled pattern of white, dull yellow, reddish-brown, and black. The ventral surface of foot colored with randomly mottled brown and creamy yellow. Siphon evenly mottled brown and white. Siphon and proboscis capable of extending a distance at least the length of shell. Eyestalks white with small eye at base of each. Reddish-brown tentacles connected to eyestalks. Sexes separate with females being larger. More specific details of morphology and coloration of *T. minamiae* are best conveyed in the live animal image (Plate 7, A). Some internal organs (particularly the large liver) exhibit a mottled pattern with coloration resembling that of the outer shell surface.
Type Locality. The holotype (Figure 1) was collected in Taiohae Bay, Nuku Hiva, Marquesas Islands, French Polynesia.
Distribution. Marquesas Islands, French Polynesia.
Habitat and Biology. Found primarily at the base of reef slopes in areas of deep sand and gravel beds with overlying rocks and coral rubble. The author has observed them at depths from 14 to 30 meters with most specimens at around 20 meters, but they have been collected from 60 meters (Touitou & Balleton 2022). They likely have a much greater depth range given that their food source and preferred type of habitat are not restricted to the shallows. Their coloration and pattern allow them to blend in with their surroundings, particularly in deeper water where color contrast is diminished, and grey and blue tones dominate (Plate 6, B).

During the day and bright moonlit conditions, they burrow into fine substrate, particularly underneath hard slabs and structures that offer additional protection. They have been found concealed in over 10 cm of substrate, likely to evade larger predators (*e.g.*, the Marbled Stingray, *Taeniura meyeni* Müller & Henle, 1841) (Plate 6, D). Predation from stingrays and crabs is evidenced by freshly broken shells.

The author has observed them emerging to hunt at night shortly after sunset (within an hour), mostly over sand and gravel but occasionally along boulder and coral surfaces and crevices. They bury themselves again shortly after consuming prey. Freshly captured specimens will sometimes regurgitate their prey, which consists mostly of small fish that are less active at night, such as *Pseudanthias* Bleeker, 1871. Moon phase alone does not affect their foraging as long as their environment remains dark (*e.g.*, moon still blocked by dense clouds or mountains).The venomous sting delivered by the proboscis and radular harpoon is capable of causing sharp radiating pain that can last at least three weeks (Paul Kanner, personal communication).

The sexes are separate. The author observed and photographed a pair mating above the sand at night with the male up on the spire and slightly to the left of the female (Plate 6, C).

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Due to similar habitat and food requirements, *Textilia adamsonii* (Broderip, 1826) is found in the same areas as *T. minamiae*. Paul Kanner discovered an individual of each species under the same rock during our 2013 trip to Nuku Hiva.

Virtually no specimens exhibit more than very slight damage to the body whorl, in contrast to most other Conidae species, including its relative *T. adamsonii*, which often exhibit large shell scars. Also, most have intact protoconchs. These facts indicate that *T. minamiae* is a fast-maturing species.

In addition to being a mechanism of biological isolation, the powerful South Equatorial Current interacting with the Marquesas Islands causes strong upwelling and high biological productivity in the nearshore environment (Martinez *et al.*, 2009). The nutrient-rich waters from deep combine with intense, tropical sunlight year-round to encourage very high phytoplankton density, as evidenced by nearshore murky 'pea soup' water conditions (Plate 6, A). This results in high productivity at all higher trophic levels, including among the fish on which *T. minamiae* feed. From personal observation, the high prevalence of piscivorous Conidae species in the Marquesas seems to reflect the abundance of prey, with *T. minamiae* possibly being the most numerous among fish eaters, followed by *Pionoconus easoni* Petuch & Berschauer, 2018, *Pionoconus gauguini* (Richard & Salvat, 1973), *Gastridium obscurus* (Sowerby I, 1833), *Textilia adamsonii*, and *Gastridium eldredi* (Morrison, 1955).

Empty shells are often found occupied by the endemic cone shell hermit crab species *Ciliopagurus vakovako* Poupin, 2001 (Plate 7, B). Its habitat is from the intertidal zone to 53-57 m, but mainly between 10-20 m, which corresponds almost exactly with where *T. minamiae* is found (Poupin, 2001).

Etymology. Named for author's daughter, Minami, a dedicated student of biology and future medical professional whose name translates from Japanese to "Beautiful Wave" (美波).

Comparison. *T. minamiae* can be readily distinguished from its closest relatives (*T. bullatus* and *T. pongo*) by the following key characteristics: a more robust, tumid (inflated) shape; a significantly shorter spire relative to total length; a shell with slightly greater relative

Species	***T. minamiae* (n=46)**	***T. bullatus* (n=58)**	***T. pongo* (n=2)**
Shell shape	Tumid (TI=14.31)	Least tumid (TI=12.71)	Less tumid (TI=12.75)
Shell length average (range)	57.33 (45.40-68.65) mm	55.65 (43.80-73.62) mm	62.37 (66.57-58.17) mm
Spire shape	Very short (SI=3.40)	Extended (SI=5.82)	Extended (SI=5.79)
Relative weight	Light (MI=4.15)	Lighter (MI=3.98)	Lightest (MI=3.83)
Shell color (outer surface)	Reddish-brown, purple, or muted orange blotches on white and ochre	Pastel orange to red (when fresh) blotches on white and salmon-pink	Orange to red blotches on white and salmon pink
Shell pattern (outer surface)	Distinct coarse blotches and mottling with spiraling dashed lines	Most specimens with distinct finer mottling and spiraling dashed lines; occasional shells with indistinct blotches	Much less distinct, diffuse blotches
Aperture color	White, rarely pale orange	Salmon-pink to orange	Vermillion red
Distribution	Marquesas Islands	Western Pacific & Hawaii	Indian Ocean

Table 1. Comparison of *T. minamiae* with congeners *T. bullatus* and *T. pongo*. n = # of specimens.

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weight; and outer shell pattern typically with blotches of darker, more muted color; and a typically bright white instead of a salmon-pink, orange, or vermillion aperture. Table 1 provides a detailed comparison between *T. minamiae* and its congeners. Plates 1 through 5 show sample specimens of each species to more clearly elucidate their differences.

DISCUSSION

The significant differences between *T. minamiae* and its congeners have been noted by the author and other observers for some time, but this unique population of *Textilia* has not been previously analyzed in a systematic manner. The basis for describing it as a full species, rather than only as a subspecies of *T. bullatus*, incorporates:

- Unambiguous and consistent morphological characteristics. Some variability occurs between populations of *T. bullatus* within its extensive range, but no population exhibits the full combination of characteristics found in *T. minamiae*.
- Precedence for recognition of Marquesan gastropods within other genera as unique. For example, *Lambis pilsbryi* Abbott, 1961 from *Lambis crocata* (Link, 1807); *Lividiconus conco* Puillandre, Stöcklin, Favreau, Bianchi, Perret, Rivasseau, Limpalaër, Monnier & Bouchet, 2015 from *Lividiconus lividus* (Hwass, 1792); *Pionoconus easoni* from *Pionoconus catus* (Hwass, 1792); and *Harpa kolaceki* Cossignani, 2011 from *Harpa amouretta* Röding, 1798.
- Taxonomic separation within the *T. bullatus* clade where *T. pongo* is considered a different species from *T. bullatus* despite their close morphological affinity.

The discovery of a new *Textilia* species in the Marquesas was not overly surprising given the high propensity for endemism there. The author hypothesizes that *T. bullatus* is most likely the ancestor of *T. minamiae*. After the founding population of *T. bullatus* established itself in the Marquesas, the very significant geographic and oceanographic isolation mechanisms in and around this archipelago minimized opportunity for gene flow from other populations of *T. bullatus*. With its closest relatives (*i.e.*, possible sources of reinforcing ancestral genes) being hundreds to thousands of kilometers to the west or southwest in the Tuamotu and Society Archipelagos, the southwestward flowing Pacific segment of the highly stable South Equatorial Current became a particularly significant barrier (Martinez *et al*, 2020). Excellent visualizations of this current can be found on NASA's "Perpetual Ocean" animation. Over time, the isolation led to the evolution of *T. minamiae* through the founder effect (National Human Genome Research Institute, 2023).

Genetic profiling has not been conducted yet on this species, but an expedition in the near future to the Marquesas will seek to collect animal samples of *T. minamiae* for molecular analysis.

Notable information derived from this study in regard to the sister taxon *T. bullatus* include:

- The Hawaiian population possessing the longest spired (SI=6.87) and heaviest (MI=4.21) shells out of all the *Textilia* populations studied. Certain specimens also exhibit patterns with bold triangular markings not found in specimens from other locations. Additionally, they dwell relatively deep with all but one of the Hawaiian specimens found below 30 meters. With their unique characteristics, further study with a larger sample size may prove these shells to be a separate taxon.
- Marshall Island and Micronesian specimens being pale shells with fine patterning. These may also be unique.

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• Many Indonesian shells tending to be a darker red than in other populations.

The molluscan fauna of the Marquesas is immensely fascinating, and further research will undoubtedly yield new species. Among the Conidae, *T. adamsonii* in the Marquesas deserves a similar assessment as was done here for *T. minamiae*, given its differences in shape, coloration, size, and other characteristics from typical *T. adamsonii* found in the Cook Islands and other locations.

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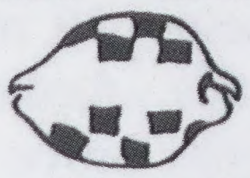

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Plate 1. Paratypes 1-4 of *Textilia minamiae* with length (Lm) and collection information for each. Top two specimens are a pair with female at top. All specimens with intact periostracum. Photos by D. Lum.

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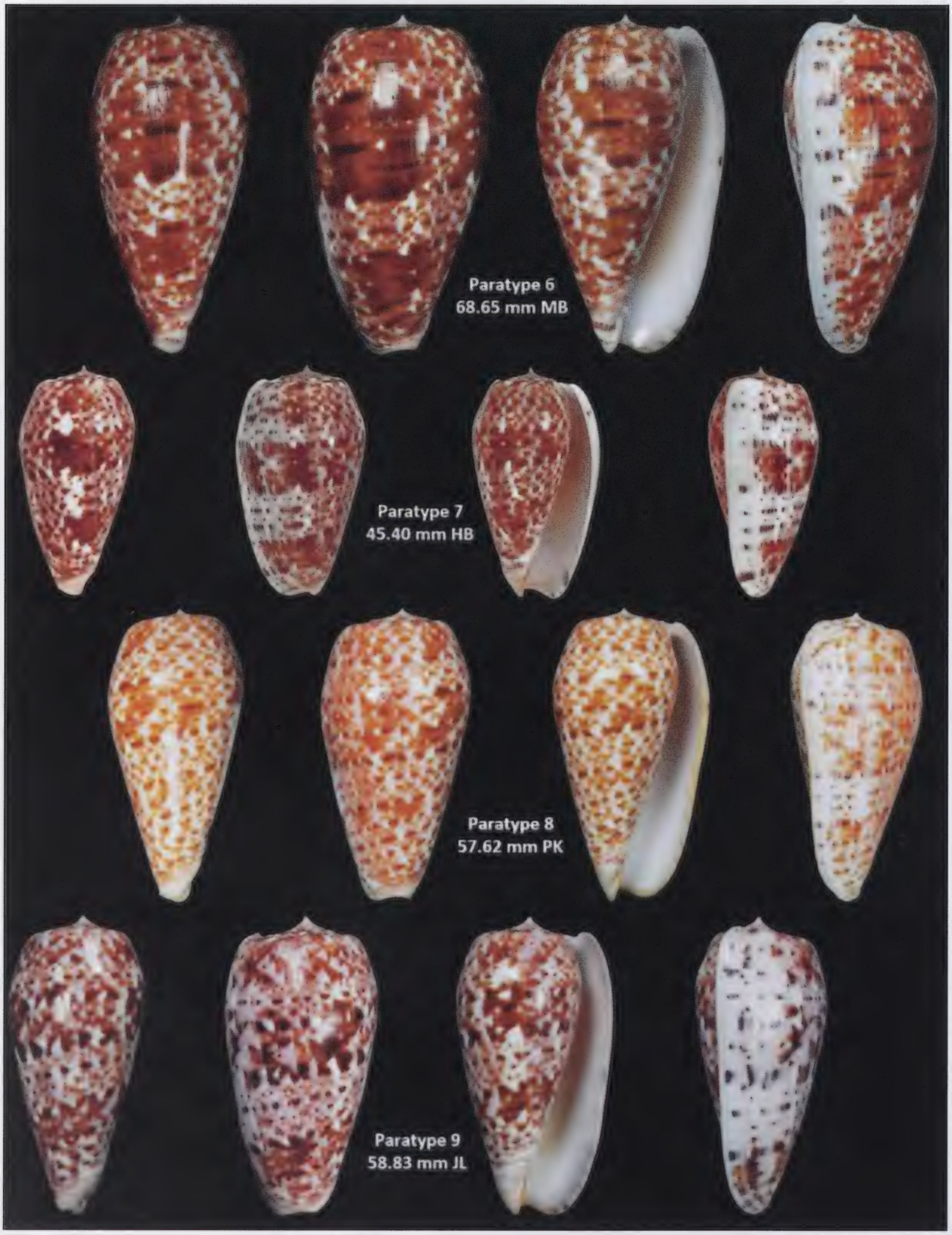

Plate 2. Paratypes 6-9 of *Textilia minamiae* with length (Lm) and collection information for each. Photos of smallest specimen (45.4 mm) by H. Bedell. Other photos by D. Lum.

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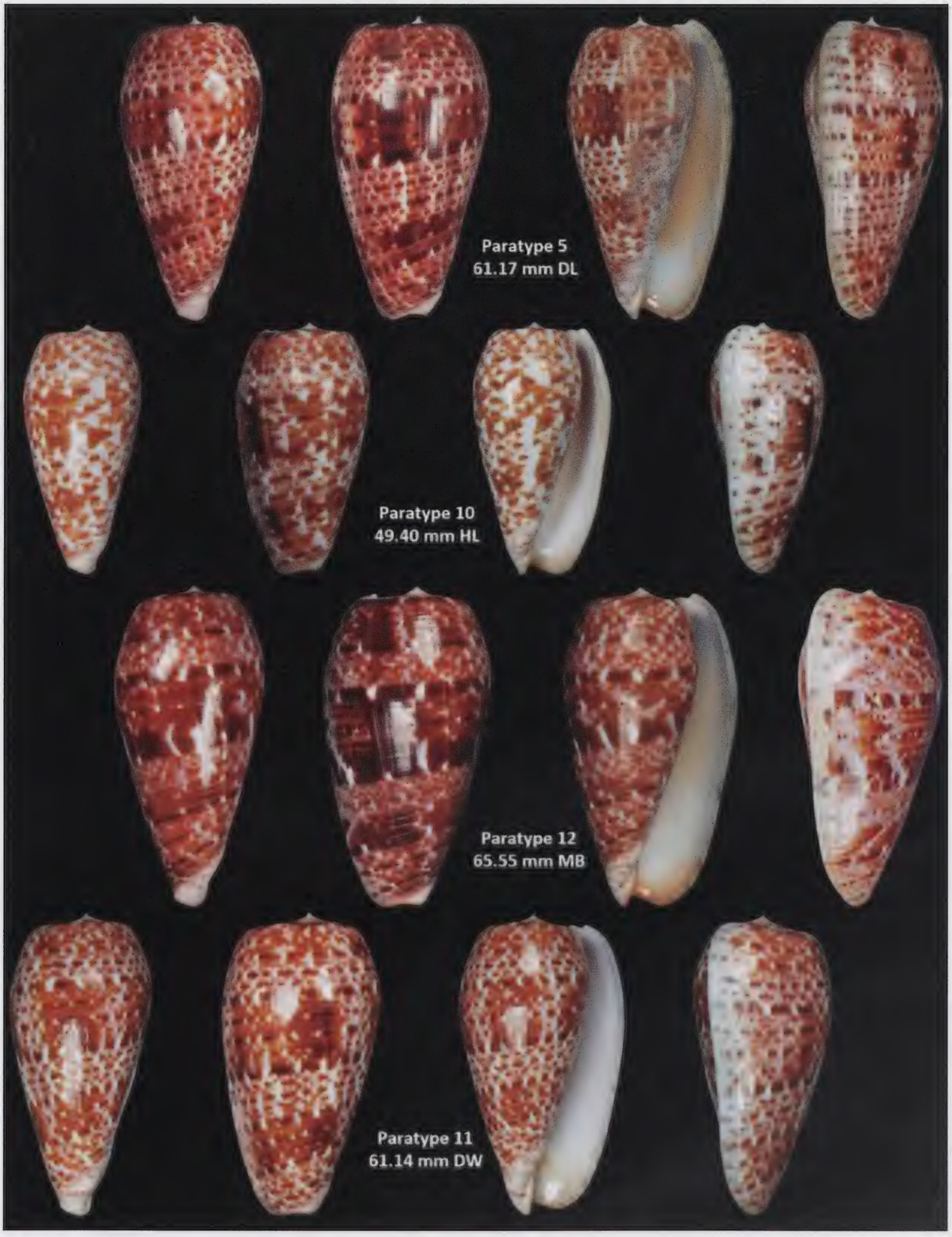

Plate 3. Paratypes 5, 10-12 of *Textilia minamiae* with length (Lm) and collection information for each. Photos by D. Lum.

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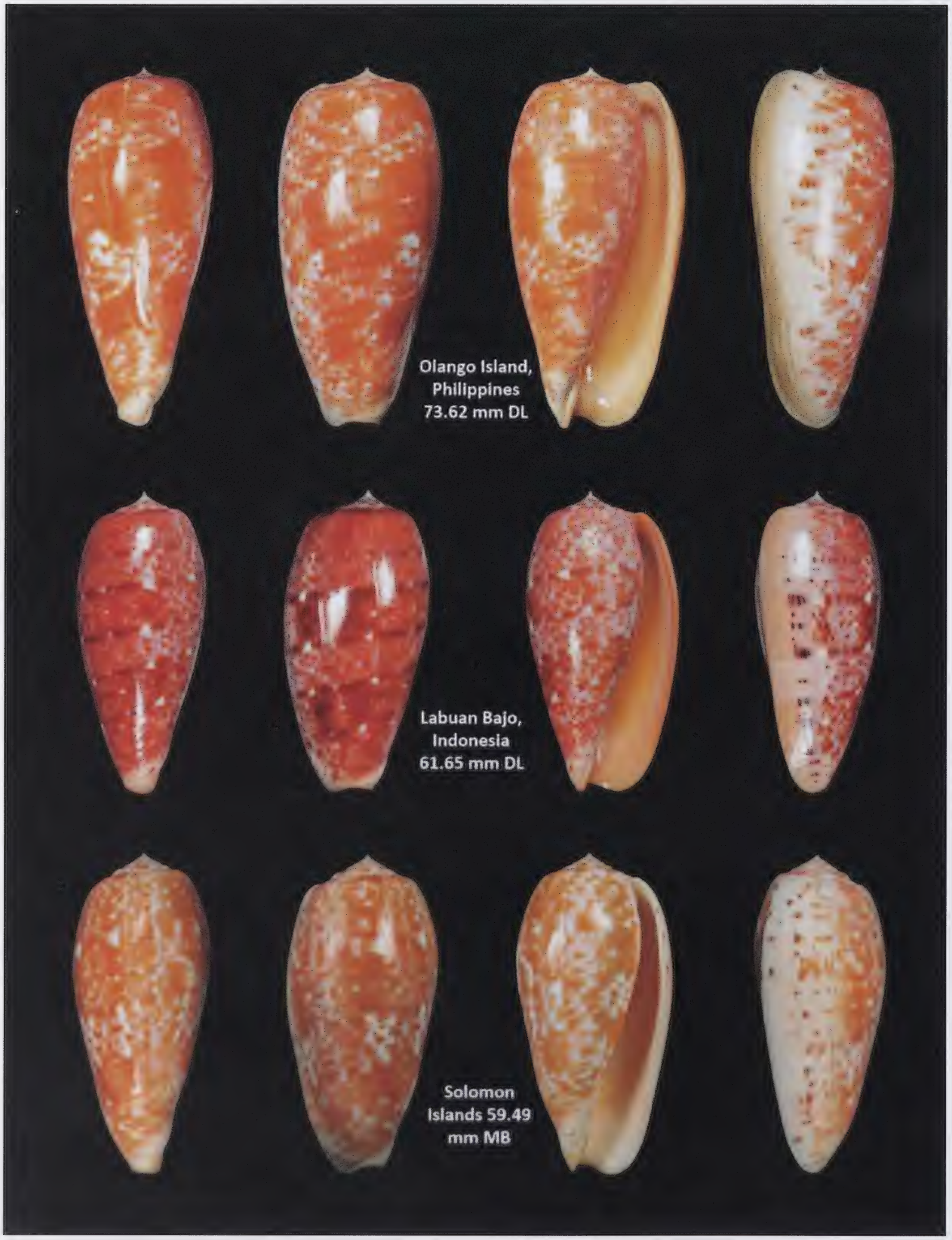

Plate 4. *Textilia bullatus* from various locations in the Western Pacific. Note the variability of *T. bullatus* in this and the next plate. Photos by D. Lum

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Plate 5. *Textilia bullatus* from the Central Pacific and *Textilia pongo* from the Indian Ocean. Photos by D. Lum.

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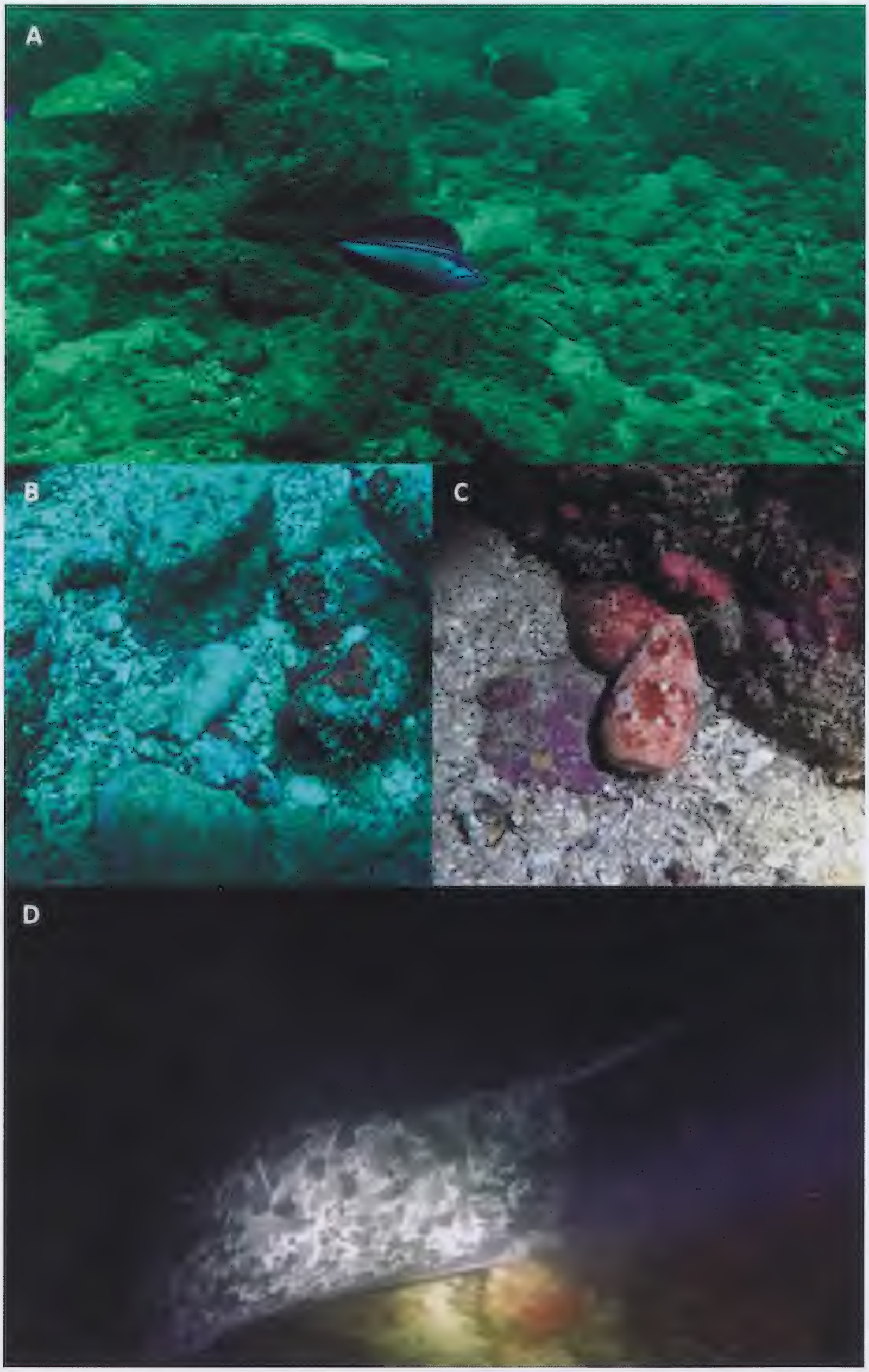

Plate 6. Natural history of *Textilia minamiae*. Photos by D. Lum.
A = Typical coral rubble, gravel, and sand habitat of *Textilia minamiae*. The green tint of the water from abundant phytoplankton is normal for the nearshore environment of the Marquesas. Male endemic Hewett's Wrasse (*Coris hewetti* Randall, 1999) in a territorial display at center.
B = *T. adamsonii* blending in with coarse gravel during daytime in deep water.
C = Pair of *T. minamiae* mating at night. The male is the lighter colored specimen.
D = The giant Marbled Stingray *Taeniura meyeni* Müller & Henle, 1841 is a ravenous predator of mollusks in *T. minamiae*'s habitat.

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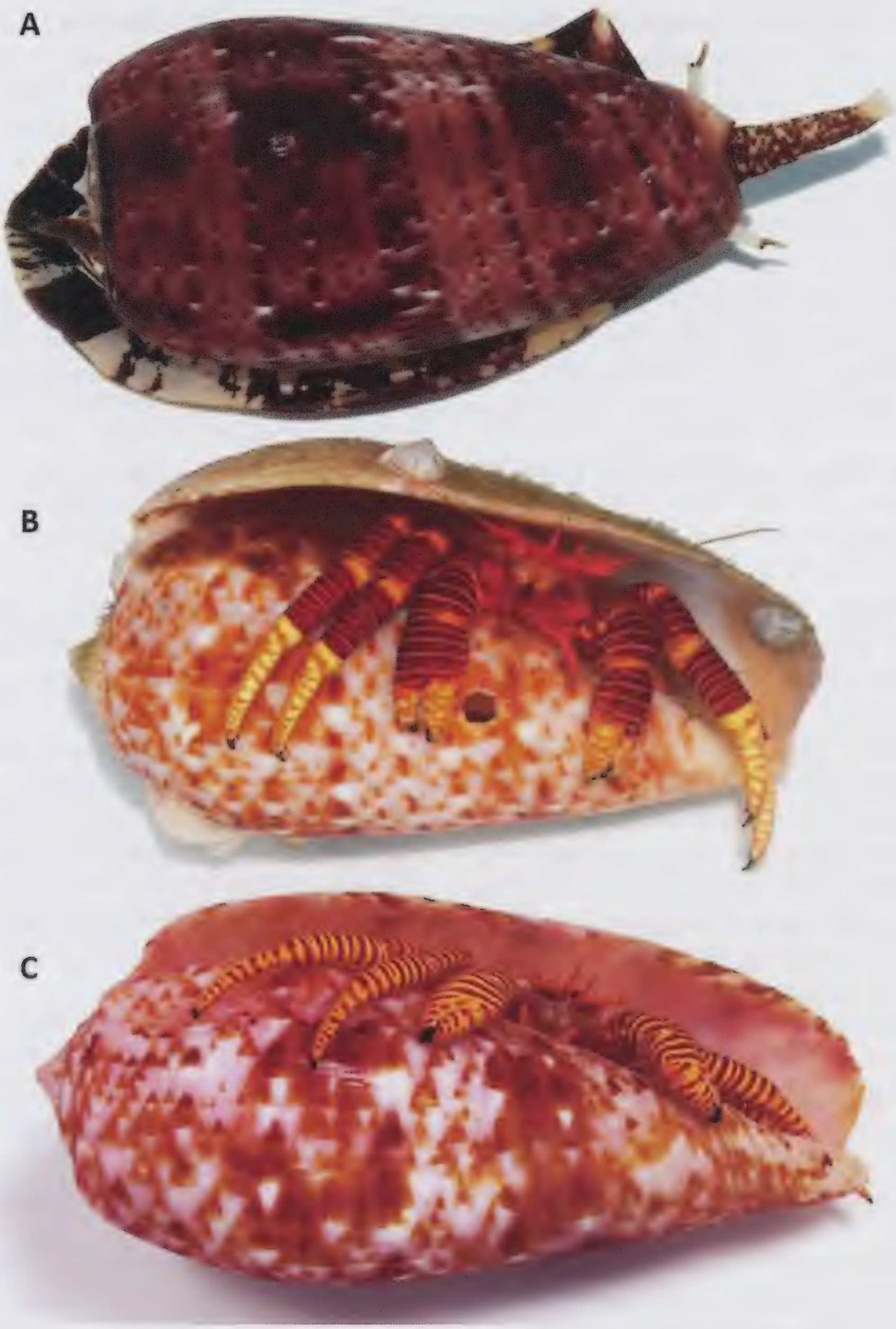

Plate 7. Shell occupants. Photos by D. Lum.
A = *T. minamiae* showing typical animal characteristics.
B = Empty *T. minamiae* shells are almost always occupied by hermit crabs, particularly the endemic *Ciliopagurus vakovako* Poupin, 2001.
C = In other parts of the Pacific, including Hawaii, *T. bullatus* shells are often inhabited by *Ciliopagurus strigatus* (Herbst, 1804). Note the differences from its Marquesan relative.

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A New Species of *Fenimorea* (Gastropoda: Drilliidae), from the Eastern Gulf of Mexico

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ABSTRACT A new species of Drilliidae, *Fenimorea falloni*, is named from relatively deep water, inhabiting the easternmost half of the Gulf of Mexico and is compared with similar congeners from the Gulf of Mexico. This new *Fenimorea* is a large, entirely white with strong shouldered whorls and beaded spiral threads, which differentiates it from other taxa.

KEYWORDS West Florida, Yucatan, Drilliidae, *Fenimorea falloni*, *F. sunderlandi*

INTRODUCTION

Some of the more dramatic molluscan species from the Gulf of Mexico (hereinafter "GOM") were discovered during the late 1960's and early 1970's, when American fishermen were allowed to trawl and dredge in the northern Yucatan Peninsula, Mexico (García, 1989). One of those fishermen was Thomas McGinn, a south Louisiana fisherman who, together with his wife Barbara McGinn, enjoyed collecting shells caught in his nets and dredges. "*Scaphella mcginnorum"* (this note, now known as *Aurinia (Garciavoluta) mcginnorum*) was named in their honor, and two of the three specimens used to describe this new species came from Mr. McGinn's fishing campaigns off the northern coast of Yucatan.

The genus *Fenimorea* has been described in great detail by Gallon (2016: 144, 146), and the species described herein comports with all the characteristics of the genus. *Fenimorea* is well represented in the western Atlantic, with more than 25 species having been assigned to the genus, many of them rather recently (Gallon 2016). Of these, 11 have been reported from the GOM.

SYSTEMATICS

Class	Gastropoda Cuvier, 1795
Subclass	Caenogastropoda Cox, 1960
Order	Neogastropoda Wenz, 1938
Superfamily	Conoidea Flemming, 1822
Family	Drilliidae Olsson, 1964
Genus	*Fenimorea* Bartsch, 1934
Type species:	*Fenimorea janetae* Bartsch, 1934, by original designation.

Fenimorea falloni Garcia, new species
(Figures 1-3)

Description. Shell large for the genus, up to 53.6 mm in length, fusiform (average width/length ratio 0.31); last whorl 50% or less of shell length, anteriorly truncated. Protoconch eroded. Teleoconch of 11 whorls; early whorls convex, progressively shouldered, becoming constricted at suture on later whorls; suture appressed. Axial sculpture of seven or eight rounded ribs on early whorls; ribs increasing to fourteen on last whorl, the tenth, situated about the last fourth of the whorl, becoming strongly varicoid (Figure 1c); ribs as wide as interspaces, almost evanescing at subsutural sulcus; numerous, weak axial threads covering surface

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of whorls. Spiral sculpture of numerous narrow, strong threads; threads becoming beaded when crossed by axial elements of lesser strength (Figure 1d); the latter taking the shape of the anal sinus at subsutural sulcus. Aperture rather wide for the genus, approximately 50% of shell width; outer lip thin, with shallow stromboid notch; anal sinus deep, U-shaped, with weak parietal callous; columellar callous smooth, slightly raised; anterior canal short, wide. Shell color is white.

Type material. Holotype (Figure 1 a-b) ANSP 494641, 52 mm, dredged at type locality; paratype 1 (Figure 2) EFG 32849 , 53.5 mm, dredged at type locality; paratype 2 (Figure 3), 51.0 mm, west of Tampa, Florida, 183 m, P. Gallon collection.

Type locality. Off Cabo Catoche, northern Yucatan Peninsula, Mexico, in 100 m.

Distribution. Eastern Gulf of Mexico: off Tampa, Florida, USA; and off northern Yucatan Peninsula, Mexico.

Etymology. Named for Mr. Phillip (Phil) J. Gallon Jr., of Farmingdale, New York, for his years of dedication to the study of Drillidae.

Diagnosis. Shell large for the genus, reaching 53.6 mm in length, entirely white; whorls with strong shoulder and beaded spiral threads.

Discussion. The following species of *Fenimorea*, and their maximum reported sizes (Gallon 2016), have been recorded from the Gulf of Mexico:

Fenimorea abscondita Gallon, 2016 - 35.8 mm
Fenimorea contracta Gallon, 2016 - 15.3 mm
Fenimorea crocea Gallon, 2016 - 15.6 mm
Fenimorea elongata Gallon, 2016 - 25 mm
Fenimorea fucata (Reeve, 1845) - 26.1 mm
Fenimorea kathyae Tippett, 1995 - 36.2 mm
Fenimorea moseri (Dall, 1889) - 31.7 mm
Fenimorea pagodula (Dall, 1889) - 22.3 mm
Fenimorea sunderlandi (Petuch, 1987) - 53.2 mm
Fenimorea tessellata Gallon, 2016 - 39.4 mm
Fenimorea tippetti Gallon, 2016 - 21.2 mm

The new species can be readily differentiated from most of the above species by its large size, strong microsculture, and white coloration. Although *Fenimorea moseri* has a white morph, it is smaller, has sharper axial costae, and a more slender outline. The new species compares most closely to *Fenimorea sunderlandi* (Petuch, 1987) (see Gallon (2016: pl. 97, fig. 1).

Fenimorea falloni can only be confused with *F. sunderlandi* (Figures 4-7), which attains almost the same size as the new species. However, *F. sunderlandi* has reddish spiral bands interrupted by white axial ribs; has weaker microsculpture and a weaker varicoid rib; has whorls with a more rounded shoulder and sharper axial ribs; and the axial ribs are stronger than the new species at sutural sulcus. The last whorl of *F. sunderlandi* averages approximately 54% of the shell length (Gallon 2016:201); that of the new species averages less than 50%.

ACKNOWLEDGEMENTS

I am grateful to Phil Gallon for allowing me to use two of his images: that of paratype 2 of *Fenimorea falloni* (Figure 3), and that of the holotpe of *Fenimorea sunderlandi* (Figure 4).

LITERATURE CITED

Gallon, P. J. 2016. Taxonomic review of tropical western Atlantic shallow water Drilliidae including description of 100 new species. Zootaxa 4090(1):1-363.

García, E. F. 1989. Two rare volutes from Yucatan: Or, a short story of the Golden Age of Shelling in the Southern Gulf of Mexico. American Conchologist 17(3):3.

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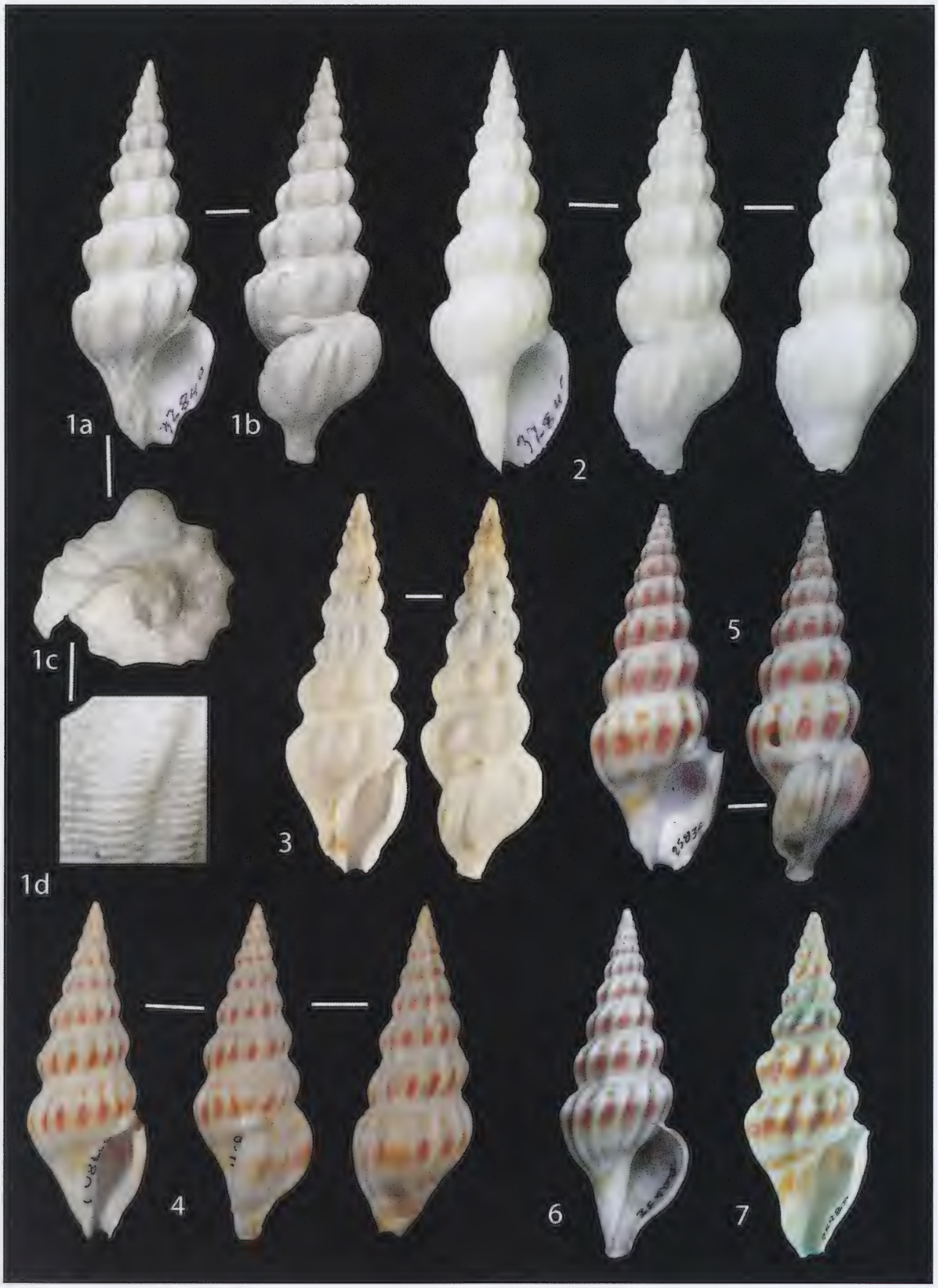

Plate 1. *Fenimorea falloni* and its congeners. Figures 1-3**:** *Fenimorea falloni* n. sp. **1**= Holotype, ANSP 494641, off Cabo Catoche, northern Yucatan Peninsula, Mexico, 100 m, 52.0 mm. **2**= Paratype 1, same locality, EFG 32849, 53.6 mm. **3**= Paratype 2, west of Tampa, Florida, 183 m, 51.0 mm, P. Fallon collection. Figures 4-7: *Fenimorea sunderlandi* (Petuch, 1987). **4**= Holotype, USNM 859800, 50 km S. of Apalachicola, Franklin Co., Florida, 39.8 mm. **5**= Off Louisiana, 27°58.34'N, 92°22.42'W, in 68-86 m, 48.2 mm, EFG 25825. **6, 7**= Campeche Bank, Mexico, 22°16.57'N, 91°23.06'W, in 114-102 m, 53.2 mm & 51.3 mm, EFG 25988.

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New Gastropods from the Gulf of Mexico

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ABSTRACT Twelve new species and subspecies of gastropods are named from three subprovinces of the Carolinian Molluscan Province that occur within the Gulf of Mexico. These include: (from the Floridian Subprovince) *Scaphella junonia glicksteinorum* n. subsp., *Scaphella (Clenchina) carrieae* n. sp., and *Scaphella (Clenchina) rundoi* n. sp. (all Volutidae); (from the Suwannean Subprovince) *Conomodulus lambi* n. sp., *Modulus danielsi* n. sp. (both Modulidae); (from the Yucatanean Subprovince) *Modulus hunahpu* n. sp., *Trochomodulus velai* n. sp. (both Modulidae), *Cinctura salasi* n. sp. (Fasciolariidae), *Lindafulgur camazotz* n. sp. (Busyconidae), *Ventrilia jonathoni* n. sp. and *Ventrilia xbalanque* n. sp. (both Cancellariidae), and *Bulla occidentalis morai* n. subsp. (Bullidae). A new scaphelline volute subgenus, *Garciavoluta* n. subgen. (type species: *Aurinia* (*Garciavoluta*) *mcginnorum*), is also described.

KEY WORDS Gastropods, Gulf of Mexico, Carolinian Molluscan Province, Floridian Subprovince, Suwannean Subprovince, Yucatanean Subprovince, Modulidae, Fasciolariidae, Busyconidae, Volutidae, Cancellariidae, Bullidae, *Conomodulus lambi, Modulus danielsi, Modulus hunahpu, Trochomodulus velai, Cinctura salasi, Lindafulgur camazotz, Scaphella (Scaphella) junonia glicksteinorum, Scaphella (Clenchina) carrieae, Scaphella (Clenchina) rundoi, Garciavoluta, Ventrilia jonathoni, Ventrilia xbalanque, Bulla occidentalis morai*

INTRODUCTION

During our research for an upcoming book on the Mollusca of the Gulf of Mexico, we have discovered that a large number of gastropods were never named or described. Of these, twelve species and subspecies were found to be of specific scientific importance, as they are representative of endemic species radiations or are indicative of new and unusual marine ecosystems that were previously unexplored. Because of their significance, we have decided to describe these new gastropods in a separate paper, as opposed to inserting a systematic appendix at the end of the book. This also allows these taxa to be used by systematic malacologists in advance of the actual publication date of the new text and data base.

The new taxa described here encompass several families in three different subprovinces of the Carolinian Molluscan Province: the Floridian Subprovince in the southeastern Gulf of Mexico (encompassing the entire Florida Coral Reef Tract), the Suwannean Subprovince in the eastern and northeastern Gulf of Mexico (entire western coast of Florida from Cape Sable northward to Pensacola), and the Yucatanean Subprovince in the southwestern Gulf of Mexico (Bay of Campeche and the Yucatan Peninsula). For details on the quantitative biogeographical analyses and spatial configurations of these provincial subunits, (see Petuch, 2013 and Petuch & Berschauer, 2020b.) These new taxa are listed here, and they can be considered index taxa for their respective subprovinces.

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Floridian Subprovince
Volutidae
Scaphella junonia glicksteinorum n. subsp.
Scaphella (Clenchina) carrieae n. sp.
Scaphella (Clenchina) rundoi n. sp.
Suwannean Subprovince
Modulidae
Conomodulus lambi n. sp.
Modulus danielsi n. sp.
Yucatanean Subprovince
Modulidae
Modulus hunahpu n. sp.
Trochomodulus velai n. sp.
Fasciolariidae
Cinctura salasi n. sp.
Busyconidae
Lindafulgur camazotz n. sp.
Volutidae
Garciavoluta new subgenus of the genus *Aurinia*
Cancellariidae
Ventrilia jonathoni n. sp.
Ventrilia xbalanque n. sp.
Bullidae
Bulla occidentalis morai n. subsp.

SYSTEMATICS

The holotypes of all twelve species and one subspecies described here are deposited in the molluscan collections of the Santa Barbara Museum of Natural History, Santa Barbara, California.

Class	Gastropoda Cuvier, 1795
Subclass	Caenogastropoda Cox, 1960
Order	Mesogastropoda Thiele, 1921
Superfamily	Cerithioidea Flemming, 1822
Family	Modulidae Fischer, 1884

One of the most dynamic groups of gastropods found within the Gulf of Mexico is the family Modulidae, which has undergone an adaptive radiation that has produced at least eight endemic species. These endemic modulid taxa are restricted to discrete areas around the Gulf, occurring from intertidal to deeper neritic environments. The Floridian Subprovince houses three species in three genera; the Turtle Grass-dwelling *Trochomodulus calusa* (Petuch, 1988) and the deep water *Conomodulus lindae* (Petuch, 1987) and *Modulus kaicherae* (Petuch, 1987), which are both associated with outer neritic red algal beds. The Suwannean Subprovince also houses two endemic modulid taxa; the Turtle Grass-dwelling *Modulus floridanus* (Conrad, 1869) and the deep water *Conomodulus lambi* Petuch & Berschauer, n. sp., which lives on offshore coralline algal beds (see Petuch & Berschauer, 2020b for descriptions of the rhodolith faunas). The most wide-ranging modulid species in the Gulf is *Modulus danielsi* Petuch & Berschauer, n. sp., which lives in shallow sea grass beds along the Florida Panhandle (western edge of the Suwannean Subprovince) and ranges down the entire coast of Texas and eastern Mexico as far as Veracruz (Tunnell *et al.*, 2010: 133). The Family Modulidae in the Yucatanean Subprovince is represented by two endemic species, *Modulus hunahpu* Petuch & Berschauer, n. sp. and *Trochomodulus velai* Petuch & Berschauer, n. sp., both of which live in nearshore sea grass beds. Considering that the entire family only contains around 20 species worldwide, it is noteworthy that almost half of the known species are restricted to the Gulf of Mexico. The Florida fossil record also contains many extinct species in the genera *Modulus*, *Trochomodulus*, and *Conomodulus* (Petuch, 1994), demonstrat-ing that the Gulf of Mexico area has been an evolutionary "hot spot" for modulids during the past 5 million years. The four new modulid species are described here and illustrated on Plates 1 and 2.

Genus *Conomodulus* Landau, Vermeij, and Reich, 2014

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Conomodulus lambi Petuch and Berschauer, new species
(Plate 1 A, B, C)

Description. Shell large for genus from 9 to 12 mm in diameter, turbinate, with high, pyramidal spire; sutures of spire whorls indented, producing rounded stepped appearance; subsutural area sloping; periphery sharply-angled, edged with strong carina; subsutural area smooth, with evenly-spaced low undulations that become stronger and more prominent on spire and early whorls; base of shell ornamented with 10 thin, strong spiral cords; body whorl varying in color from golden-tan (as in holotype) to yellow or pure white, with scattered small brown spots; protoconch and early whorls deep lavender-purple; interior of aperture white; columella with large prominent deep purple tooth.

Type Material. HOLOTYPE - diameter 12.6 mm, height 12.0 mm, north of the Dry Tortugas, SBMNH 235850; PARATYPES - 3 specimens, diameters 9.0, 10.0, and 11.0 mm, from the type locality, in the Petuch collection.

Type Locality. The holotype and the type lot were trawled on a coralline algal nodule (rhodolith) sea floor in 46 m depth, 50 km north of the Dry Tortugas, Florida Keys.

Range. The new species lives on coralline algal sea floors at depths of 40-100 m, along the entire western edge of the Florida Platform, from the Dry Tortugas northward to west of Tampa.

Etymology. Named for Paul Lamb, owner of Sarasota Exotic Shells, of Sarasota, Florida who kindly donated specimens for our research.

Discussion. Although originally thought to contain only a single living and single fossil species, both from the South Pacific (Landau, Vermeij, and Reich, 2014), the genus *Conomodulus* is now known to contain two more living species from the Gulf of Mexico. One of these, *Conomodulus lindae* (Petuch, 1987) (Plate 1 D), is known to be a component of the deep water red algae beds off southeastern Florida and the Florida Keys (Petuch, 2013; Petuch & Myers, 2014; Petuch & Berschauer, 2020b). The other species, *Conomodulus lambi* n. sp., has recently been discovered in the coralline algal rhodolith beds along the outer edge of the Florida Platform off western Florida. This new species differs from its only Atlantic congener in being a much larger, broader, and more inflated shell, with a lower spire. *Conomodulus lambi* also lacks the knobby sculpture and strong spiral cords that are so diagnostic of *C. lindae*. Both species have bright purple protoconchs and early whorls, showing a close relationship.

Genus *Modulus* Gray, 1840

Modulus danielsi Petuch and Berschauer, new species
(Plate 2 A, B, C)

Description. Shell of average size for genus from 9 to 11 mm in diameter, discoidal, with sharply-angled periphery and broad sloping subsutural area; periphery edged with single large, rounded cord; subsutural area of body whorl and spire whorls sculpted with 14-15 thin, elongated, evenly-spaced costae per whorl, arranged in oblique radial pattern; subsutural costae overlaid with 4 large, strong spiral cords, giving the thin costae a beaded appearance; base of shell with 6-7 large, rounded, spiral cords; spire whorls and subsutural area; shell base color pale tan; spiral cords colored with small dark brown, closely-packed spots, creating distinct dashed or checkered pattern; peripheral cord white with widely-separated dark brown spots; brown coloring of subsutural area and spire whorls concentrated within depressions between costae, producing radial pattern; interior of aperture pale tan; columella with single large purple-tan tooth.

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Type Material. HOLOTYPE - diameter 9.5 mm, height 9.3 mm, Panama City, Bay County, Florida, SBMNH 235851; PARATYPE - diameter 11.0 mm, from the type locality, in the Petuch collection.

Type Locality. In Shoal Grass (*Halodule*), in 0.5 m depth, St. Andrew's Bay, Panama City, Bay County, Florida.

Range. The new species ranges from Cedar Key, Levy County, Florida to the Mississippi River Delta, Louisiana, and along the Texas coast at least as far as the Nueces County coastline.

Etymology. Named for Capt. Craig Daniels of Chokoloskee Island, Florida who has aided the authors in their research within the Ten Thousand Islands of southwestern Florida.

Discussion. This new modulid has the widest range of any of the Gulf of Mexico *Modulus* species, being found along the entire northern Gulf coast, from Cedar Key, Florida to central Texas (Tunnell, *et al.*, 2010). Of the known modulids of the Gulf area, *Modulus danielsi* is similar only to *M. floridanus* (Conrad, 1869) (Plate 1 E, F), a species restricted to the southern part of the Suwannean Subprovince, from the Ten Thousand Islands of southwestern Florida northward to Tampa, Florida. The new northern and western Gulf species differs from its southern Florida congener in being a smaller shell with a much more ornate sculptural pattern, having more numerous and stronger spiral cords on the subsutural area of the body whorl and on the spire whorls, and in having more numerous radiating subsutural costae (14-15 on *danielsi* and 11-12 on *floridanus*). The number and thickness of the spiral cords on the base of the shells also differs, with *danielsi* having 6-7 thin cords while *floridanus* has only 4 thick spiral cords. *Modulus danielsi* is also a much less colorful shell than *M. floridanus*, lacking the broad yellow bands on either side of the white peripheral cord, and having, instead a uniformly tan shell that is heavily maculated with numerous closely-packed small brown spots and patches.

Modulus hunahpu Petuch and Berschauer, new species
(Plate 2 D, E, F)

Description. Shell of average size for genus from 10 to 16 mm in diameter, flattened, discoidal, with sharply-angled periphery and broad sloping subsutural area; periphery edged with single large, rounded cord; subsutural area sculpted with 11-12 large, prominent, evenly-spaced undulating costae, arranged in radial pattern; edges of subsutural costae overlap peripheral cord, producing star-shaped pattern when seen from above; base of shell with 3 very large, rounded, spiral cords; spire whorls and subsutural area sculpted with 3 small, thin spiral cords and 1 larger cord adherent to suture; shell base color white; spiral cords colored with large dark brown, evenly-spaced elongated flammules, creating distinct dashed pattern; peripheral cord with largest and most prominent dark brown and white alternating pattern; brown coloring of spire cords concentrated within depressions between undulating costae, with costal ridges being pure white; interior of aperture white; columella with single large tooth.

Type Material. HOLOTYPE - diameter 10.0 mm, height 8.8 mm, from Celestun, Yucatan Peninsula, Mexico, SBMNH 235852; PARATYPES - diameters 15.0 mm and 16.0 mm, from the type locality, in the Petuch collection.

Type Locality. Found on the beach, Celestun Lagoon, Celestun, Yucatan State, Mexico.

Range. Restricted to the Yucatan Peninsula of Mexico, from eastern Tabasco State to Isla Contoy, Quintana Roo State, where it lives in shallow water Turtle Grass (*Thalassia testudinum*) beds within quiet, sheltered coastal lagoons.

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Etymology. The taxon honors Hunahpu, one of the Hero Twins described in the Popol Vuh, the Mayan sacred book. Hunahpu's head was torn off by the bat spirit, Camazotz, who then presented it to the Lords of the Underworld, who used it in their sacred ball games.

Discussion. This new Yucatan endemic sea grass species is most similar to the wide-ranging Caribbean *Modulus modulus* (Linnaeus, 1758) (Plate 1 H), but differs in having a more discoidal shell with a noticeably-lower spire, in having proportionally much larger and more prominent subsutural costae, and in having more numerous and finer cords around the base of the shell.

Genus *Trochomodulus* Landau, Vermeij, and Reich, 2014

Trochomodulus velai Petuch and Berschauer, new species
(Plate 2 G, H, I))

Description. Shell of average size for genus from 11 to 12 mm in diameter, trochoidal, broadly biconic; periphery of body whorl sharply-angled, with a single, large, prominent rounded cord, forming peripheral keel; subsutural areas of body whorl and spire whorls sloping at acute angle, with slightly undulating surface; subsutural area sculpted with 4 thin raised cords; base of shell ornamented with 5 large spiral cords, with anteriormost cord being smallest; shell base color white or pale whitish-yellow; all cords on body whorl and peripheral keel marked with large equally-distanced discrete dark brown flammules, producing distinct checkered color pattern; aperture white within interior; columella pale tan, with single large white tooth.

Type Material. HOLOTYPE - diameter 11.7 mm, height 11.3 mm, found on the beach, Celestun Lagoon, Celestun, Yucatan State, Mexico, SBMNH 235853; PARATYPES - 11.0 mm and 12.0 mm, from the type locality, in the Petuch collection.

Type Locality. Celestun Lagoon, Celestun, Yucatan State, Mexico.

Range. Restricted to the Yucatan Peninsula of Mexico, from eastern Tabasco State to Isla Contoy, Quintana Roo State, where it lives in shallow water Turtle Grass (*Thalassia testudinum*) beds within quiet, sheltered coastal lagoons.

Etymology. Named for Luis Vela of Merida, Yucatan, Mexico, who donated the type material for this new species and other smaller Yucatan shells.

Discussion. Of the known modulid species found in the Gulf of Mexico, *Trochomodulus velai* is most similar to *Trochomodulus calusa* (Petuch, 1988) (Plate 2 J, K) from the Florida Keys and Floridian Subprovince. The new Yucatan species differs from its Floridian congener in being a larger, more trochiform species, with a higher spire and more acutely-angled subsutural area. The peripheral keel cord of *T. velai* is proportionally thicker and better-developed than that of *T. calusa* and the cords on the subsutural area are also thicker, better-developed, and more prominent. The surface of the subsutural area of *F. calusa* is also much smoother and unornamented, with only a few faint undulations.

Order	Neogastropoda Wenz, 1938
Superfamily	Buccinoidea Rafinesque, 1815
Family	Fasciolariidae Gray, 1853
Subfamily	Fasciolariinae Gray, 1853
Genus	*Cinctura* Hollister, 1957

Cinctura salasi Petuch and Berschauer, new species
(Plate 3 C, D)

Description. Shell of average size for genus from 50 to 64 mm in length, highly inflated, roundly fusiform, with proportionally short

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siphonal canal; spire protracted, with deeply-incised sutures, producing rounded spire whorls; protoconch rounded, dome-like; first 3 postnuclear whorls conspicuously sculpted with 8-10 strongly-incised spiral threads and low undulations, producing distinctive grooved appearance; shell base color white, with numerous, evenly-spaced pale orange flammules arranged in zebra pattern; base color overlaid with 7-8 reddish-brown widely-separated spiral bands (7 on holotype), with anteriormost band overlapping onto base of siphonal canal; anterior tip of siphonal canal colored orange-brown; siphonal canal ornamented with 7 large, prominent cords; aperture proportionally large, flaring oval in shape; columella arcuate, with 2 large plicae at anterior end.

Type Material. HOLOTYPE - length 51.6 mm, width 26.5 mm, in Celestun Lagoon, Mexico, in shallow water, SBMNH 235854; PARATYPES - 63.9 mm and 62.7 mm, from the same locality as the holotype, in the Berschauer collection.

Type Locality. Celestun Lagoon, Celestun, Yucatan State, Mexico. The holotype was found washed onto the beach near Turtle Grass beds.

Range. The new species ranges along the northern coast of the Yucatan Peninsula, from Celestun to Isla Holbox. Dead specimens have been observed to have washed onto beaches throughout this area.

Etymology. Named for Felix Salas of San Jose, Costa Rica, who kindly donated the type lot of the new species.

Discussion. Although resembling the widespread Carolinian Province *Cinctura hunteria* (Perry, 1811) (Plate A, B; found in the Georgian and Floridian Subprovinces, and southern part of the Suwannean Subprovince) in general shape and color pattern, the Yucatanean Subprovince endemic *C. salasi* differs primarily in having heavily-ornamented early whorls, sculpted with deeply-incised spiral grooves. In contrast, *C. hunteria* consistently has smooth early whorls and also differs in shell proportions, being a less inflated and rotund shell with a more elevated spire and proportionally-longer siphonal canal. The Yucatan endemic species also differs in having more dark color bands than its eastern Gulf congener; with 7-8 on *salasi* and only 5-6 on *hunteria*. In this respect, *C. salasi* resembles the offshore, deeper water Yucatan species, *C. connori* Petuch & Berschauer, 2020 (Plate 3 E, F; originally described as a subspecies of the Texan Subprovince *C. lilium* but now considered to be a full species), which generally exhibits 8-9 dark bands. (see Petuch & Berschauer, 2020a). *Cinctura salasi* may eventually be shown to represent a shallow-water derivative of the deeper neritic *C. connori*.

Family Busyconidae Wade, 1917
Subfamily Busyconinae Wade, 1917
Genus *Lindafulgur* Petuch, 2004

Lindafulgur camazotz Petuch and Berschauer, new species
(Plate 4 D-F)

Description. Shell of average size for genus from 100 to 210 mm in length, with proportionally very long siphonal canal that comprises one-half of entire shell length; body whorl inflated with rounded sides, distinctly turnip-shaped, with sharply-angled shoulder; spire pyramidal, slightly scalariform, with strongly sloping subsutural areas; shoulder of body whorl and spire whorls carinate, ornamented with 14-18 widely-separated, sharply-pointed spiked knobs along shoulder carina; body whorl ornamented with very numerous fine raised spiral cords, producing rough, file-like texture; thinner and finer spiral cord present between each pair of larger cords; entire siphonal canal, from body whorl juncture to anterior tip, heavily ornamented with very strong, prominent spiral cords with smaller

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secondary cords between each pair of main cords; spire whorls (Plate 4 F) heavily ornamented with 10-14 large, evenly-spaced spiral cords; smaller and thinner cords sometimes present between pairs of primary cords; shell color pale orange-yellow with 2 broad bands of dark orange-brown, one below shoulder and one below mid-body of body whorl; mid-body marked with single wide colorless band of pale orange; some specimens with pale violet patches below shoulder area; intersection of color band with shell growth increments producing dark brown longitudinal flammules, creating a "zebra" or checkered color pattern; spire whorls with many dark brown radiating flammules, with each corresponding to a shell growth increment; aperture wide and oval-shaped, containing numerous large, evenly-spaced cords; interior of aperture uniformly bright orange with white edge along lip margin; protoconch proportionally large, bulbous and rounded, composed of 2 whorls, pale yellow in color.

Type Material. HOLOTYPE - length 207.0 mm, width 105.0 mm, 120 m depth off Isla Blanca, Mexico, SBMNH 235855; PARATYPES - lengths 108.0 mm, 109.0 mm, 111.0 mm, and 117.0 mm, from the type locality, in the Petuch collection; lengths 93.4 mm, 93.6 mm, 95.0 mm, 103.0 mm, 104.0 mm, 107.0 mm, and 112.0 mm, from the type locality, in the Berschauer collection; lengths 97.0 mm and 104.0 mm from the type locality, in the Mark Johnson collection.

Type Locality. Trawled by deep water shrimpers from 120 m depth off Isla Blanca, Quintana Roo State, Yucatan Peninsula, Mexico.

Range. At present, only known from 120 m depth off the eastern side of the Yucatan Peninsula, Mexico.

Etymology. "Death Bat" in K'iche Mayan; a bat spirit creature in the service of the Lords of the Underworld, who inhabit Xibalba. According to the text of the Popol Vuh (Mayan scared book), Camazotz tore the head off Hunahpu, one of the Hero Twins, when he entered Xibalba with his brother, Xbalanque. Camazotz then gave the head to his lords, who used it as a ball in their sacred ball games. Camazotz is also the senior author's favorite Mayan demigod.

Discussion. This large busyconid is the third-known species of *Lindafulgur* discovered in the Gulf of Mexico; with the wide-ranging *L. candelabrum* (Lamarck, 1816) (Plate 4 A-C), found from southern Texas to Isla Holbox, Quintana Roo State, Mexico, and the thin and delicate, bright orange *L. lyonsi* (Petuch, 1987) from off the western Florida continental shelf (see Petuch, 1987). Of these two, the only species that is closest to the eastern Yucatan *L. camazotz* is the wide-ranging *L. candelabrum*. The well-known *Lindafulgur candelabrum* differs from *L. camazotz* in the following ways: **1.** by having a flatter spire that is not distinctly stepped or elevated; **2.** by having fewer and proportionally-larger shoulder spines, which are frequently flattened, blade-like, or paddle-shaped (like Lamarck's holotype); **3.** by having a coarser body whorl and spire sculpture, composed of fewer but larger and more widely-spaced spiral cords; **4.** by always having a white or pale yellow-white aperture, as opposed to the bright orange aperture seen on *camazotz*. The new species is most frequently encountered in an area extending from Isla Holbox eastward to Isla Mujeres in Quintana Roo State. *Lindafulgur candelabrum*, on the other hand, is most frequently collected by shrimpers on the Campeche Bank, especially the areas off Progreso, Yucatan State and is also collected, in deeper water, as far north as Port Isabel, Cameron County Texas.

Superfamily	Volutoidea Rafinesque, 1815
Family	Volutidae Rafinesque, 1815
Subfamily	Scaphellinae Gray, 1857
Genus	*Scaphella* Swainson, 1832

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Members of this genus have proportionally-large, rounded and dome-shaped protoconchs, four strong ridge-like columellar plicae, and early whorls that are heavily-sculptured with longitudinal ribs and fine spiral threads. The checkered spots are large and prominent, even on the early whorls of the spire.

Scaphella (Scaphella) junonia glicksteinorum
Petuch and Berschauer, new subspecies
(Plate 5 C-G)

Description. Shell small for species from 60 to 65 mm in length, with adults attaining only one third to one half the length of the nominate subspecies; body whorl inflated, with rounded sides, smooth and polished, with silky texture; spire proportionally very low, subpyramidal; shoulders of body whorl and spire whorls slightly angled, with angulation being most prominent of spire whorls; protoconch covered with large golden-brown calcarella, producing distinct dome-like appearance to apex; first two post-nuclear whorls ornamented with numerous low, faint, rib-like longitudinal costae; body whorl and spire with ivory-white base color, which is overlaid with 7 rows of elongated, rounded, reddish-brown checker-like spots; 7 main rows of spots often with subsidiary or partial rows of smaller spots between them; checkered spots along subsutural area of the shoulder, adjacent to suture, larger and more elongated than spots in adjacent rows; columella straight, ornamented with 4 large folds, with their edges recurved posteriorly, producing distinct indented ramps; anterior end of columella and fasciole pale orange tan in color; aperture uniformly narrow, pale yellow-orange within interior; edge of lip on fully adult specimens (like the holotype) is recurved posteriorward

Type Material. HOLOTYPE - length 61.7 mm, width 26.0 mm, 8 m depth off Looe Key, Florida Keys, SBMNH 235856; PARATYPES - length 62.5 mm, in a sand pocket on a living coral patch reef, 5 m depth, south of Big Munson Island, Big Pine Key, Monroe County, Florida, in the Petuch collection; length 65.0 mm, found freshly-dead on clean carbonate sand, 5 m depth off Pickles Reef, Plantation Key, northern Florida Keys, Monroe County, Florida, in the Berschauer collection.

Type Locality. Collected on clean carbonate sand among living corals, 8 m depth north of Looe Key Reefs, Looe Key, Lower Florida Keys, Monroe County, Florida.

Range. The new subspecies is found in shallow water (2-10 m depths) on the Florida Coral Reef Tract, which extends from Palm Beach County, Florida to the Dry Tortugas, where it is associated with clean carbonate sand among living corals.

Etymology. Named for Dr. Marvin and Patricia Glickstein of North Palm Beach, Florida, in recognition of their years of intensive dredging for deep water shells off the coast of southeastern Florida. Using only a small dredge, pulled up from 70-120 m depths by hand, the Glicksteins discovered many new species from off Palm Beach, and several of them now bear their names.

Discussion. This dwarf shallow water subspecies of *Scaphella junonia* has been collected in the Florida Keys for over 50 years, but was never formally described as a separate genetically-isolated population. Petuch & Myers in their book on the shells of the Florida Keys (2014: 118, figure 6.8 G, H) illustrate a 65 mm specimen (now in the Berschauer collection) from 3 m depth on Pickles Reef, off Plantation Key. This specimen was originally considered to be a paratype of the much larger *S. junonia elizabethae* Petuch & Sargent, 2011 (Plate 5 B), a subspecies that is now known to be confined to deeper water (approximately 50 m depth) areas off the Dry Tortugas and the adjacent Tortugas Shrimping Ground to the north. The new subspecies differs from its deeper-water

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western congener in the following shell characters: **1.** being consistently a much smaller shell, only one-half the length of a fully-adult *elizabethae*; **2.** in having a narrower, more fusiform shell with straighter sides; **3.** in having a proportionally much lower spire, with the shoulders of the spire and body whorls being distinctly angled; **4.** in having less-ornamented post-nuclear whorls, with only small, faint ribs present on the first whorl; **5.** in having more numerous and more closely-packed elongated rectangular spots, which vary from dark brown to reddish-brown, with the latter color being the most commonly-encountered; on *elizabethae*, the spots are rounded in shape, are proportionally larger in size, and are widely separated from each other.

True *Scaphella junonia junonia* (Lamarck, 1804) (Plate 5 A) is rarely encountered in the Florida Keys, primarily because it lives in much deeper water along this area and has only been dredged on the deep terraces (100-200 m depths) off the southern side of the Florida Keys Archipelago. It is far more commonly-encountered along eastern Florida, from Palm Beach County northward, and along western Florida, from the Ten Thousand Islands north to Tampa. The new subspecies *glicksteinorum* occupies the shallow coral reef platform ecological niche and all its available food resources that are not being utilized by the deep water nominate subspecies. The subspecies *elizabethae* is confined to the outer edge of the southwestern Florida Continental Shelf and is a faunal component of the highly endemic Tortugas molluscan fauna (Petuch, 2013; Petuch & Berschauer, 2020b). The Florida Coral Reef Tract and the Florida Keys Archipelago are now known to house three subspecies of scaphelline volutes; *Scaphella junonia junonia* along the deep water terraces that border the Straits of Florida; *Scaphella junonia glicksteinorum* on shallow water coral reefs; and *Scaphella junonia elizabethae* from moderate depths around the Dry Tortugas and the southwestern edge of the Florida Continental Shelf.

Subgenus *Clenchina* Pilsbry and Olsson, 1953

Members of this subgenus have smaller, more elongated, and distinctly cylindrical shells, with three-to-four columellar plicae. Protoconchs are proportionally large, rounded and distinctly domelike. On most *Clenchina* species, the early whorls are heavily ornamented with a single row of large, elongated riblike knobs.

Scaphella (Clenchina) carrieae Petuch and Berschauer, new species
(Plate 6 A-F)

Description. Shell small for subgenus from 32 to 44 mm in length, broadly rhomboid, with proportionally-low spire; shoulder of body whorl and spire whorls strongly carinate, with large, prominent rounded carina that projects beyond shell outline; shoulder carina heavily ornamented with large, prominent elongated rib-like knobs, averaging 20 per whorl; subsutural area distinctly sloping, grading directly into knobbed carina; shell with silky texture, ornamented with very numerous, extremely fine spiral threads, which become larger and coarser on anterior half of body whorl; entire shell colored pale straw-yellow, overlaid with 6-7 rows of evenly-spaced orange-tan rectangular spots on body whorl anterior of shoulder carina and 1-2 orange-tan spots on sloping subsutural area posterior of shoulder carina; aperture open, flaring, narrowing toward anterior end; interior of aperture pale yellow; columella slightly arcuate, with 3 large, thin blade-like folds; protoconch proportionally very large, smooth, rounded and dome-shaped, composed of 2 whorls.

Type Material. HOLOTYPE - length 42.0 mm, width 19.0 mm, 550 m depth off Key Largo,

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Florida Keys, Monroe County, Florida, SBMNH 235857; PARATYPES - length 40.0 mm, 700 m depth in the Straits of Florida south of Key West, Monroe County, Florida, in the Petuch collection: lengths 44.0 mm and 32.0 mm, from 750 m depth in the Straits of Florida south of Key West, Monroe County, in the Berschauer collection; 14 specimens, in the Douglas Shelton collection, as follows: Florida Straight between Florida Keys and northeastern Cuba, dredged from 1,200 feet in 1969 (46.1, 32.4, 45.9, 30.0, 34.9, and 40.2 mm in length); Monroe County, Florida, off Key West, R/V Combat St. 444, at 25°11'N 79°55'W, at 300 fathoms, July 23, 1957 (49.7 and 37.7 mm in length); Monroe County, Florida, SW of Key West, dredged from 125 fathoms (42.6 mm in length); and specimens from old collections with questionable localities: "Palm Beach County, Florida, south of Boynton Inlet", dredged from 125 fathoms, July 14, 1968 (44.0 mm in length); "Broward County, Florida, off Hillsboro Light", 150 fathoms (37.2 and 16.6 mm in length); "Palm Beach County, Florida, off Boynton Beach, Ocean Ridge," trawled from 105 fathoms, June 11, 1953 (33.1 and 32.1 mm in length).

Type Locality. The holotype was dredged by the R/V *Combat* (station 444; 25 degrees, 11 minutes North; 70 degrees, 55 minutes West) from 550 m depth in the Straits of Florida southeast of Key Largo, Florida Keys, Monroe County, Florida (collected on 7/22/1957).

Range. The new species is primarily known from deep water (500-750 m) in the Straits of Florida, south of the Florida Keys, from Key Largo to Key West.

Etymology. Named for Carrie Shelton of Mobile, Alabama, who has assisted her husband, Douglas Shelton, with his studies of the Gulf of Mexico Volutidae.

Discussion. Of the known species in the subgenus *Clenchina*, the new species is closest to *Scaphella (Clenchina) marionae* Pilsbry and Olsson, 1953 (Plate 6 H, I), a species found in the Bathyal Zone along western Florida, from off Fort Myers north to Cedar Key. Although often synonymized with the widespread Gulf of Mexico *S. (Clenchina) robusta* (Dall, 1889), *S. (Clenchina) marionae* is a smaller shell than *robusta*, with a more inflated body whorl, proportionally lower spire, and different color pattern composed of widely-spaced dark brown spots on a white base color, as opposed to the pale yellow base color seen on *robusta*. Of these two related species, *S. (Clenchina) carrieae* is morphologically-closest to the western Florida *marionae* but differs in the following ways: **1.** having a less inflated shell with a distinct rhomboidal shape; **2.** in having a silkier shell sculpture that lacks the heavy raised cords seen on *marionae*; **3.** in having a much better-developed shoulder carina with proportionally much larger knobs; **4.** in having the shoulder carina knobs extend along the entire body whorl except for the labial area (in *marionae* the carina knobs only extend around half the body whorl); **5.** in having a pale straw-yellow shell color with orange checkered spots, while *marionae* has a white shell with small, rounded dark brown spots.

Scaphella (Clenchina) carrieae is also similar to *S. (Clenchina) florida* (Clench and Aguayo, 1940) (Plate 6 G), another volute that is endemic to the Florida Keys and has, essentially, the same range as the new species. This species, however, lives in much shallower water than does *carrieae*, preferring depths of around 200-300 m as opposed to 700-750 m. *Scaphella (Clenchina) florida* also has a very prominent shoulder carina that is ornamented with large elongated knobs, but these are confined to the early whorls (usually first three whorls) and are not present on the body whorl. *Scaphella (Clenchina) florida* is also a larger and more elongated shell than is *carrieae* and has a dark yellow-orange base color, similar to that seen on

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the widespread Gulf of Mexico *S. (Clenchina) dohrni* (Sowerby III, 1903). The northern Cuban *S. (Clenchina) cuba* Clench, 1946 shares the same stocky, rhomboidal shape and strong shoulder carina that are seen on *S. (Clenchina) carrieae*, but differs in having a color pattern composed of thin longitudinal "zebra" stripes as opposed to the discrete checkers seen on the new species.

Scaphella (Clenchina) rundoi Petuch and Berschauer, new species
(Plate 7 C-G)

Description. Shell small for subgenus from 38 to 58 mm in length, distinctly fusiform and inflated, with proportionally-low, subpyramidal spire; body whorl smooth, with silky texture composed of very numerous, closely-packed fine spiral threads; shoulder and subsutural area greatly sloping, fusing directly into body whorl; spire whorls conspicuously angled on early whorls, with some specimens having faint, poorly-developed, elongated ribs on the first two postnuclear whorls; protoconch proportionally large, dome-shaped, rounded, composed of 2 whorls; shell base color pale yellow or pale yellow-tan, overlaid with 8 rows of small, evenly-spaced light brown checkers; some specimens with secondary subsidiary rows of smaller spots present between rows of larger spots; aperture open and flaring, pale yellow within interior; columella relatively straight, ornamented with 3 large, thin, blade-like folds.

Type Material. HOLOTYPE - (fragmentary) length 58.0 mm, width 21.7 mm, trawled from 400 m depth NW of the Dry Tortugas, Florida Keys, SBMNH 235858; PARATYPES - length 41.5 mm, trawled from 400 m depth north of the Dry Tortugas, Florida Keys, in the Petuch collection; lengths 40.3 mm and 46.5 mm, 350 m depth north of the Dry Tortugas, Florida Keys, Monroe County, Florida, in the Berschauer collection; 8 specimens in the Douglas Shelton collection, as follows: Florida Straight between Florida Keys and northeastern Cuba at 1,200 feet depth in 1969 (51.3 and 51.2 mm in length); Monroe County, Florida, off Dry Tortugas at 125 fathoms (48.9 and 39.3 mm in length); Monroe County, Florida, off Key West, trawled from 75 fathoms in 1969 (45.6 mm in length); Monroe County, Florida, off Key West, trawled from 100 fathoms (39.3 mm in length); Monroe County, Florida, off Key West, R/V Combat St. 444, at 25°11'N 79°55'W, at 300 fathoms, July 23, 1957 (46.3 mm in length); and a specimen from an old collection with a questionable locality: "Palm Beach County, Florida, off Boynton Beach," trawled from 105 fathoms, June 11, 1953 (38.1 mm in length).

Type Locality. Known from the area around the Dry Tortugas, western Florida Keys, Monroe County, Florida, in depths of 350-400 m.

Range. Known primarily from deep water around the Dry Tortugas, western Florida Keys. The species may also inhabit the Bathyal Zone at the edge of the southwestern Florida Continental Shelf, in depths averaging 400 m.

Etymology. Named for Louie Rundo of Broadview Heights, Ohio who kindly donated rare and important Gulf species for our research.

Discussion. Of the known *Clenchina* species, the Dry Tortugas *S. (Clenchina) rundoi* is most similar to the widespread Gulf volute, *S. (Clenchina) dohrni* (Sowerby, 1903) (Plate 7 A, B), but differs in the following ways: **1.** in being a smaller shell, averaging 50 mm, as opposed to the 70-80 mm length of an average *dohrni*; **2.** in being a much more inflated shell with more-rounded sides and a distinctly-fusiform shell; **3.** in having a proportionally lower spire that is not as protracted and elevated as that of *dohrni*, often being only one-half the total length; **4.** in having small, poorly-developed ribs on the early whorls of some specimens, a shell character that is absent on specimens of *dohrni*; **5.** in having a pale straw-yellow base color that is overlaid with eight rows of pale tan, widely-spaced light brown spots as opposed to the dark yellow-

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orange base color and 8-10 rows of large, dark brown checkers seen on *dohrni*. *Scaphella (Clenchina) rundoi* is also similar to the exceedingly rare and poorly-known *S. (Clenchina) atlantis* Clench, 1956 (Plate 7 H) from deep water in the Straits of Florida between Cuba and the Florida Keys, but differs in being a more inflated shell with more rounded sides and in lacking the prominent sharply-angled shoulder.

Genus *Aurinia* H. and A. Adams, 1853

Subgenus *Garciavoluta* Petuch and Berschauer, new genus

Diagnosis. Shells large for genus, averaging 225 mm in length, extremely elongated and fusiform, with high, elevated spires and very protracted and narrow siphonal canals; columella straight, ornamented with 2 large folds; shell color golden-tan, grading into light brown on the siphonal canal; first 3 postnuclear whorl marked with 2 or 3 rows of very small, widely-separated round dots; dotted pattern disappears on later whorls; protoconch proportionally extremely large, bulbous and globe-shaped, composed of 2 whorls; protoconch with uniform dark reddish-brown color.

Type Species. *Aurinia (Garciavoluta) mcginnorum* (Garcia and Emerson, 1987), by monotypy. Originally described as "*Scaphella*" *mcginnorum* (shown here on Plate 7 I, J).

Distribution. The monotypic subgenus is confined to deep water areas off the northeastern side of the Yucatan Peninsula of Mexico, from Isla Holbox to Isla Contoy. Most of the known specimens have been collected by shrimpers from 300 m off Contoy Light.

Etymology. Named for Dr. Emilio Garcia of Lafayette, Louisiana, in recognition of his many important contributions to the malacology of the Gulf of Mexico, especially his discovery and naming of *Aurinia mcginnorum*.

Discussion. The new monotypic subgenus represents a separate clade off the main *Aurinia* branch of scaphelline volutes. Its placement as a subgenus of *Aurinia* and not *Scaphella* is due to the fact that *mcginnorum* only has two thin columellar plicae, as does *Aurinia s.s.*, and not three or four as seen in *Scaphella s.s.* and *Scaphella (Clenchina)*. Unlike the true *Aurinia (Aurinia)* and *Aurinia (Rehderia)* species, the new subgenus lacks any type of checkered color pattern on the body whorl and penultimate whorl and also has a proportionally much longer and narrower siphonal canal. The primary shell character that sets *Garciavoluta* apart from the other related subgeneric groups is the presence of the unusually-large, bulbous, knob-like brown protoconch, which is a unique feature that is seen only in the new subgenus.

Family Cancellariidae Lamarck, 1799
Subfamily Cancellariinae Forbes & Hanley, 1851
Genus *Ventrilia* Jousseaume, 1887

Ventrilia jonathoni Petuch and Berschauer, new species
(Plate 8 H, I, J)

Description. Shell small for genus at approximately 12 mm in length, subcylindrical, highly inflated, with proportion-ally low scalariform spire and planar subsutural area; shoulder of body whorl rounded, ornamented with 12 low, smooth knobs; body whorl sculptured with 2 rows of closely-packed, proportionally-large rounded knobs around midline of body whorl; each row of midline knobs composed to 2 closely-packed smaller rows of secondary knobs arranged in oblique pattern; some oblique rows fuse together into almost-solid oblique bars, all arranged in echelon pattern; rounded knobs overlaid with numerous strong spiral cords; body whorl and

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spire colored reddish-orange; subsutural area pure white, contrasting with red-orange body whorl color; aperture wide, flaring, triangular, white within interior; columella straight, white in color, with 2 small folds; umbilicus narrow but deep.

Type Material. HOLOTYPE - length 12.0 mm, width 11.0 mm, Telchac Puerto, Yucatan State, Mexico, SBMNH 235859.

Type Locality. On the beach at Telchac Puerto, Yucatan State, Mexico.

Range. Specimens of this new cancellariid have been collected as beach specimens from Telchac, Yucatan State to Isla Contoy, Quintana Roo State, Yucatan Peninsula, Mexico.

Etymology. Named for Jonathon Berschauer, son of the junior author, an avid outdoors-man and naturalist who has assisted in field studies and collection in Cancun, Mexico, and other localities.

Discussion. This small colorful new cancellariid is closest only to the wide-ranging *Ventrilia tenerum* (Philippi, 1848) (Plate 8 A, B) from the Floridian and Suwannean Subprovinces but differs in being a much smaller species with a much stronger sculpture pattern composed of obliquely-aligned rows of large fused rounded knobs instead of 2 rows of discretely-separated smaller knobs. *Ventrilia jonathoni* is also a far more colorful shell than the uniformly straw-colored *V. tenerum*, being a bright red-orange shell with a pure white spire (shown here on Plate 8 J).

Ventrilia xbalanque Petuch and Berschauer, new species
(Plate 8 C, D)

Description. Shell small for genus at approximately 16 mm in length, cylindrical, with high, protracted, scalariform spire; shoulder of body whorl rounded, ornamented with 15 low, smooth knobs; body whorl sculpture consisting of 2 large, prominent rounded spiral cords around midbody and 25 smaller subsidiary spiral cords; shell color uniformly deep golden orange, with shoulder knobs being darker brown-orange; aperture flaring, triangular in shape, pale tan within interior; columella straight, white in color, with 2 small plicae; umbilicus very wide and flaring.

Type Material. HOLOTYPE - length 16.0 mm, width 12.0 mm, from Telchac Puerto, Yucatan, Mexico, SBMNH 235860.

Type Locality. On the beach at Telchac Puerto, Yucatan State, Mexico.

Range. Specimens of this new cancellariid have been collected as beach specimens from Telchac, Yucatan State to Isla Contoy, Quintana Roo State, Yucatan Peninsula, Mexico.

Etymology. The taxon honors Xbalanque, brother of Hunahpu and one of the Mayan Hero Twins described in the Popol Vuh. Xbalanque, along with his brother, crossed the Rainbow Bridge into the underworld of Xibalba and survived an attack by the bat spirit demigod, Camazotz.

Discussion. *Ventrilia xbalanque* does not resemble either of the two known *Ventrilia* species from the Carolinian Molluscan Province; *V. jonathon* and *V. tenerum*. Of these two congeners, the new species is closest to *tenerum* (Plate 8, A, B) but differs in lacking the strong knobs on the body whorl, in being a more cylindrical and elongated shell, and in having the dark brown-orange shell color. With these shell characters, *Ventrilia xbalanque* actually closely resembles *V. bullatum* (Sowerby I, 1832) from the Eastern Pacific Panamic Molluscan Province and appears to be the western Atlantic cognate species of its Eastern Pacific congener.

Subclass	Heterobranchia Gray, 1840
Infraclass	Euthyneura Spengel, 1881
Order	Cephalaspidea Fischer, 1883
Superfamily	Bulloidea Gray, 1827
Family	Bullidae Gray, 1827
Genus	*Bulla* Linnaeus, 1758

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Bulla occidentalis morai Petuch and Berschauer, new subspecies

(Plate 8 E, F)

Description. Shell smaller than nominal subspecies from 11 to 17 mm in length, ovate, inflated, subcylindrical; spire low, with deeply-perforate apical pit; shell smooth and polished with 8 thin spiral cords around anterior end; posterior end of labrum projecting beyond plane of spire; shell color white overlaid with widely-separated reddish-brown amorphous patches and small brown speckles; anterior end of body whorl colored pale orange; aperture wide and flaring, white within.

Type Material. HOLOTYPE - length 17.4 mm, width 10.4 mm, Celestun Lagoon, Yucatan, Mexico, SNMNH 235861; PARATYPE - length 11.0 mm, from the same locality as the holotype, in the Petuch collection.

Type Locality. Celestun Lagoon, Celestun, Yucatan State, Mexico, near a bed of Turtle Grass (*Thalassia testudinum*).

Range. Restricted to the Yucatan Peninsula of Mexico, from eastern Tabasco State to Isla Contoy, Quintana Roo State, where it lives in shallow water Turtle Grass (*Thalassia testudinum*) beds within quiet, sheltered coastal lagoons.

Etymology. Named for Gilberto Naal Mora of Celestun, Yucatan, Mexico, who collected the holotype.

Discussion. This new subspecies of the widespread western Atlantic *Bulla occidentalis* A. Adams, 1850 (Plate 8 G) is restricted to the Yucatan Peninsula and appears to represent a genetically-isolated population that inhabits the coastal lagoons. The new Yucatan subspecies differs from the wide-ranging nominate subspecies in being consistently a much smaller shell (averaging 12 mm as opposed to 35 mm for *occidentalis*), in having a narrower and more cylindrical shell, in having a more sharply-projecting and narrower posterior labral projection, and in having a distinctive color pattern of large, discrete, brown patches distributed on a white background, producing a slightly checkered appearance, as opposed to the dark-colored and densely-patterned *occidentalis*. What malacologists call *"Bulla occidentalis"* may actually represent a complex of closely-related sibling species and subspecies, with the Yucatanean Subprovince *morai* representing a Yucatan endemic and the Floridian Subprovince *Bulla frankovichi* Petuch & Myers, 2014 representing a dark-banded dwarf taxon that is endemic to the Florida Keys (see Petuch & Myers, 2014).

ACKNOWLEDGMENTS

For the donation of study specimens of the new taxa, we wish to thank the following; without their help these new gastropods would have remained unknown to the scientific world: Lou Rundo; Felix Salas; Douglas Shelton; Mark Johnson; Gilberto Naal Mora; Dr. Marvin, Patricia, and Linda Glickstein; Marcus and Jose Coltro; Luis Vela; Paul Lamb; and Kevin Haley.

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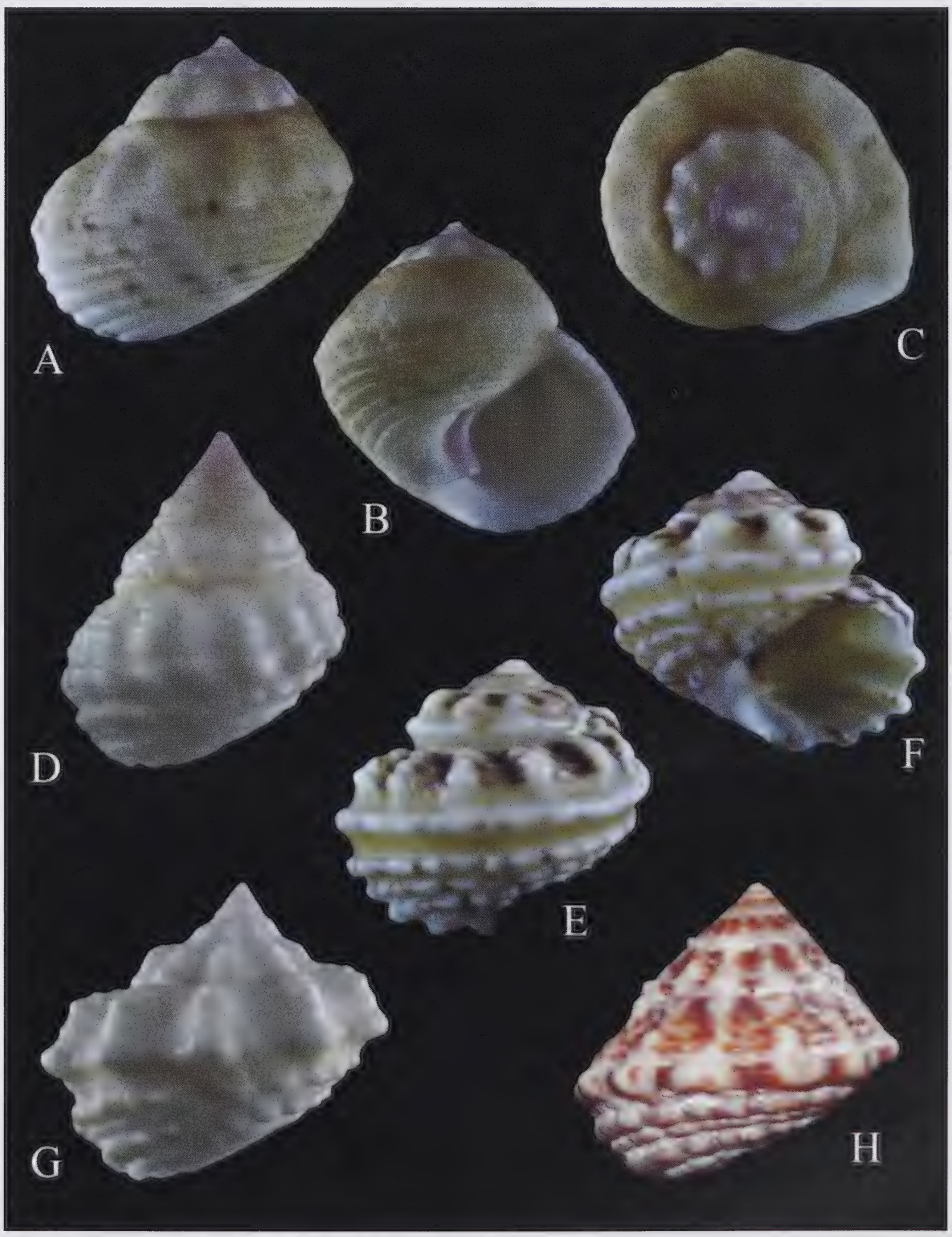

Plate 1. Modulidae of the Gulf of Mexico.
A, B, C= *Conomodulus lambi* Petuch & Berschauer, new species, holotype, diameter 12.6 mm, trawled from coralline algal beds in 46 m depth, 50 km north of the Dry Tortugas, Florida Keys; **D**= *Conomodulus lindae* (Petuch, 1987), height 18.0 mm, on red algae trawled from 40 m depth off Key Largo, Florida Keys, Monroe County, Florida; **E, F**= *Modulus floridanus* (Conrad, 1869), diameter 15.0 mm, on *Halodule* Shoal grass in 0.5 m depth off Fort DeSoto Park, Pinellas County, Florida (for comparison with *M. danielsi*); **G**= *Modulus kaicherae* Petuch, 1987, trawled from 60 m depth along the deep reef off Palm Beach Island, Palm Beach, Florida; **H**= *Modulus modulus* (Linnaeus, 1758), diameter 13.0 mm, found in a Turtle Grass bed at Fajardo, Puerto Rico (for comparison with *Modulus hunahpu*, *M. floridanus*, and *M. danielsi*).

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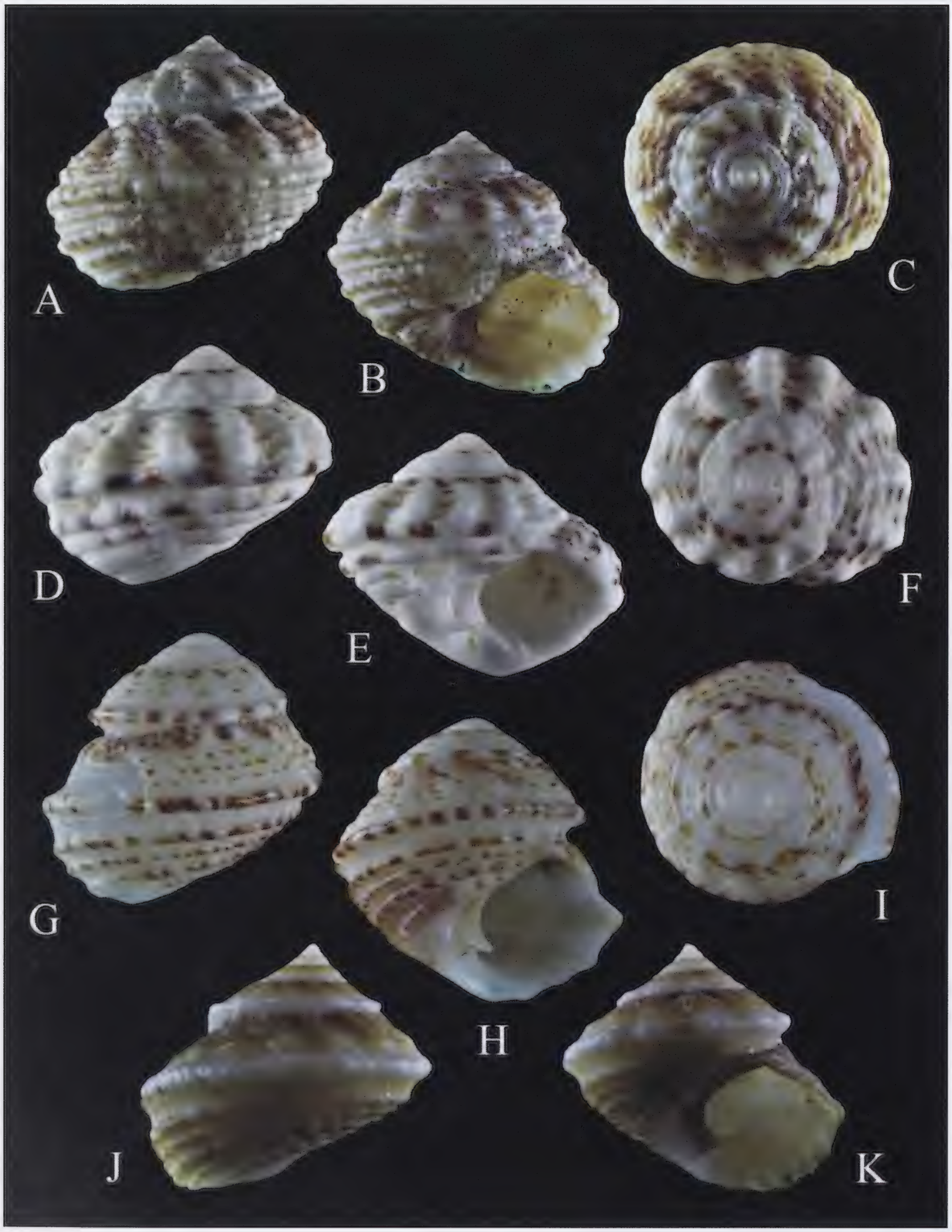

Plate 2. Modulidae of the Gulf of Mexico.
A, B, C= *Modulus danielsi* Petuch & Berschauer, new species, holotype, diameter 9.5 mm, in sea grass in 0.5 m depth, St. Andrew's Bay, Panama City, Bay County, Florida; **D, E, F**= *Modulus hunahpu* Petuch & Berschauer, new species, holotype, diameter 10.0 mm, washed onto the beach in Celestun Lagoon, Celestun, Yucatan State, Mexico; **G, H, I**= *Trochomodulus velai* Petuch & Berschauer, new species, holotype, diameter 11.7 mm, washed onto the beach in Celestun Lagoon, Celestun, Yucatan State, Mexico; **J, K**= *Trochomodulus calusa* (Petuch, 1988), diameter 12.0 mm, in 1 m depth on Turtle Grass bed, off Middle Torch Key, Florida Keys, Monroe County, Florida (for comparison with *Trochomodulus velai* n. sp.).

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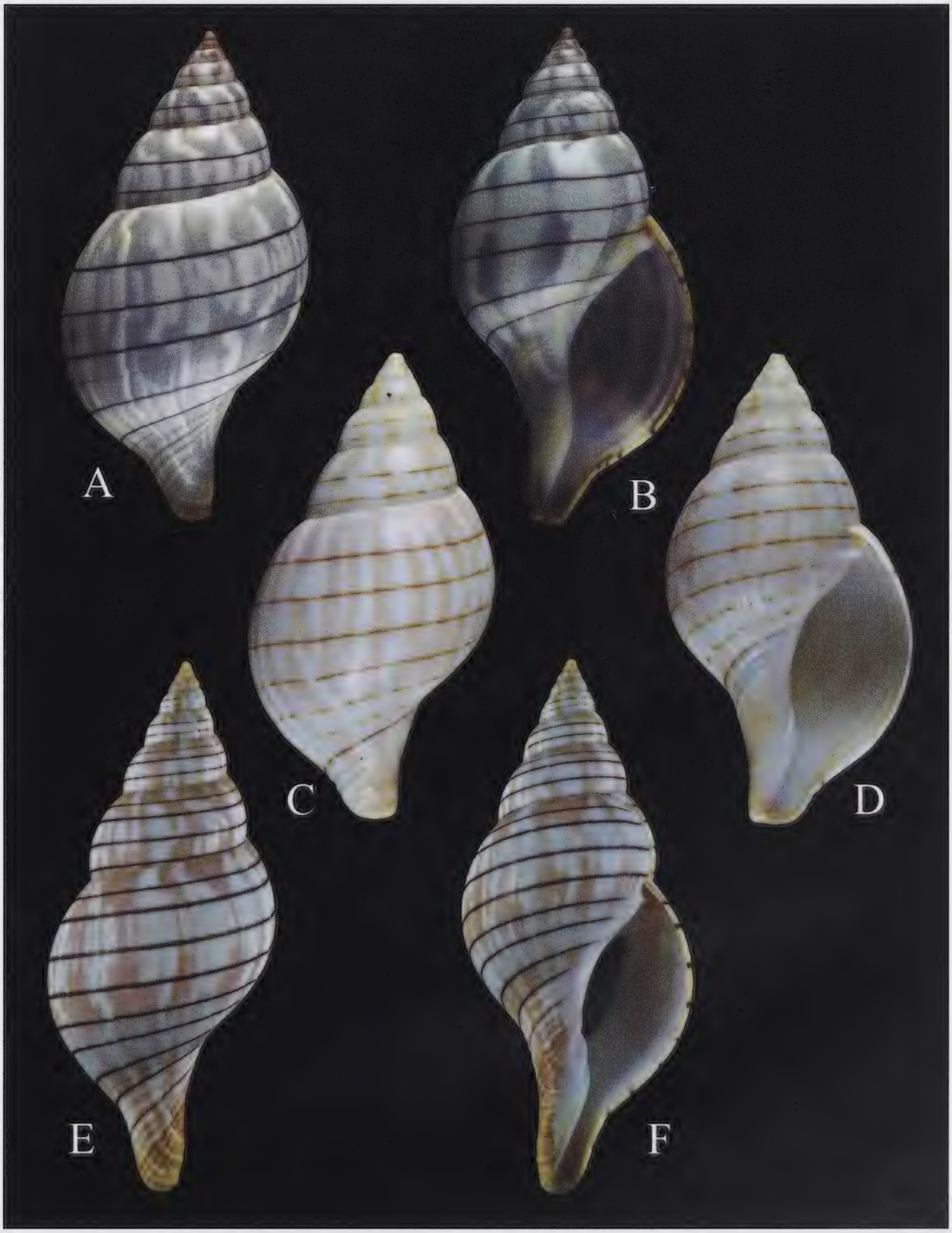

Plate 3. *Cinctura* Species from the Gulf of Mexico.
A, B= *Cinctura hunteria* (Perry, 1811), length 78.0 mm, collected at low tide on sand and sea grass, Camp Lulu Key, Collier County, Ten Thousand Islands, Florida; **C, D**= *Cinctura salasi* Petuch & Berschauer, new species, holotype length 51.6 mm, washed onto the beach along Celestun Lagoon, Celestun, Yucatan State, Mexico; **E, F**= *Cinctura connori* Petuch & Berschauer, 2020, length 73.0 mm, trawled from 250 m depth off Cabo Catoche, Quintana Roo State, Mexico.

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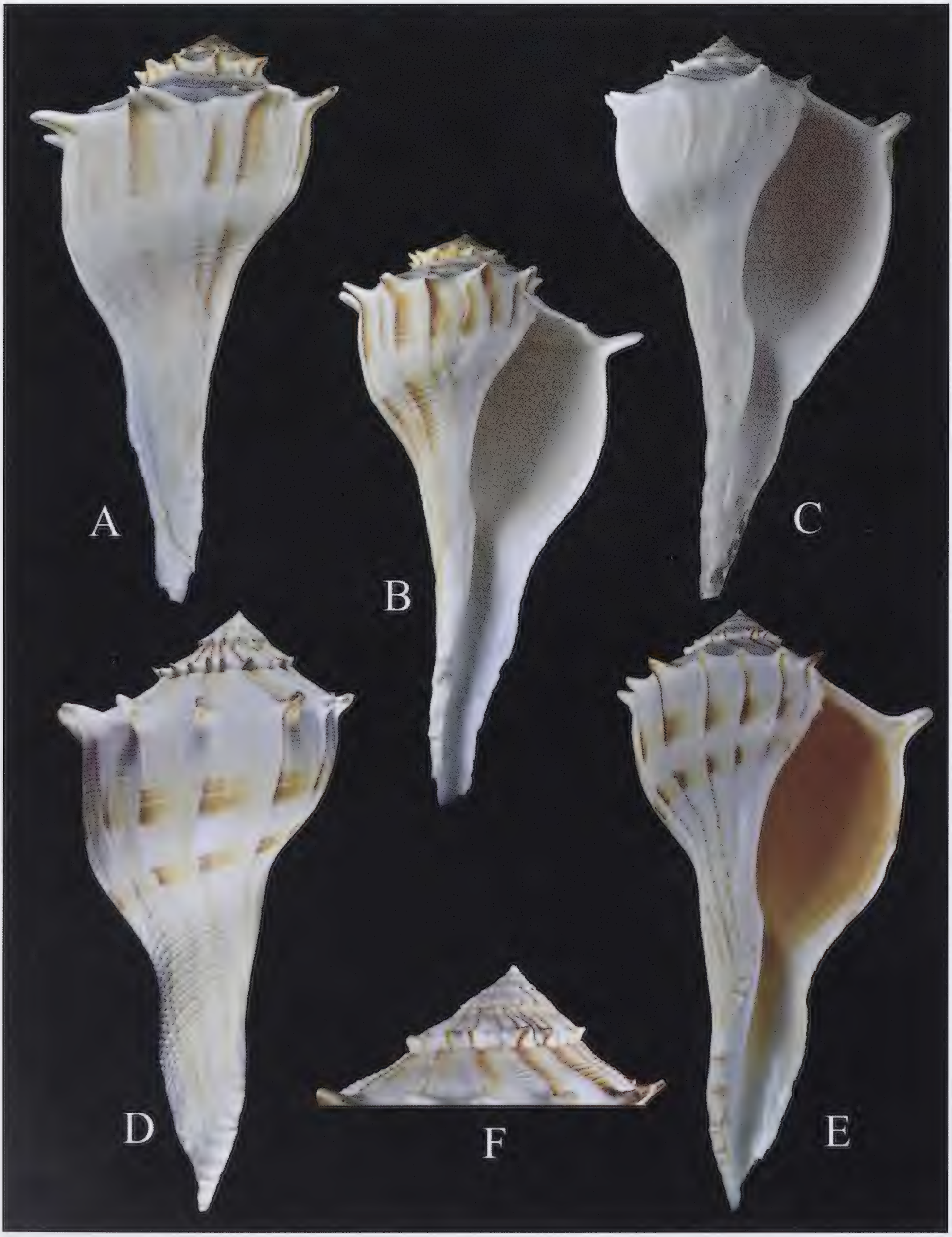

Plate 4. *Lindafulgur* Busyconids from the Yucatan Peninsula.
A, B= *Lindafulgur candelabrum* (Lamarck, 1816), length 181.0 mm, trawled from 50 m depth on the Campeche Bank off Progreso, Campeche State, Mexico (for comparison with *L. camazotz*); **C**= *Lindafulgur candelabrum* (Lamarck, 1816), length 225.0 mm, trawled by shrimpers from 50 m depth off Progreso, Campeche State, Mexico; **D, E**= *Lindafulgur camazotz* Petuch & Berschauer, new species, holotype, length 207.0 mm, trawled by shrimpers from 120 m depth off Isla Blanca, Quintana Roo State, Yucatan Peninsula, Mexico; **F**= *Lindafulgur camazotz*, detail of the spire whorls, showing the spiral cord sculpture and bulbous protoconch.

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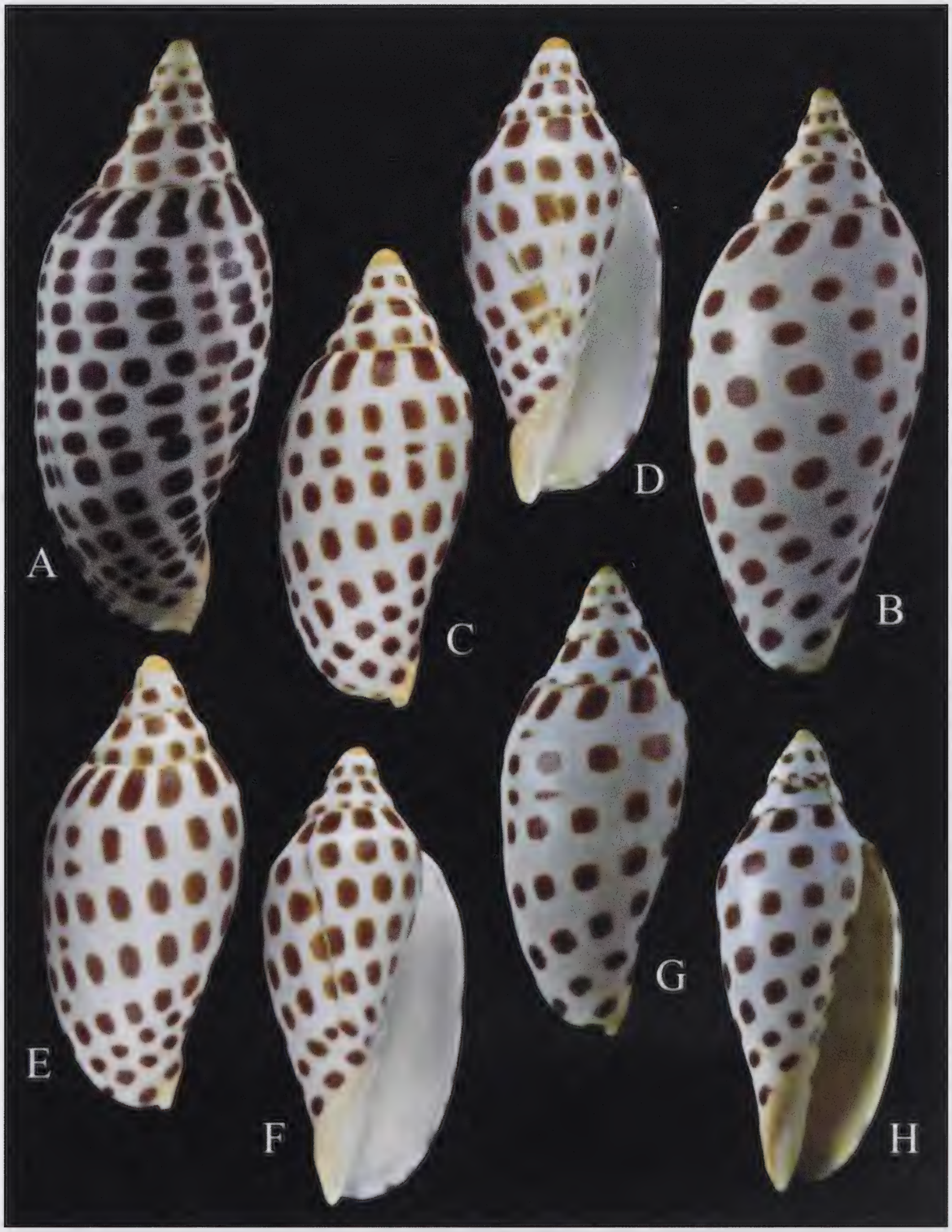

Plate 5. *Scaphella (Scaphella) junonia* subspecies from southern Florida.
A= *Scaphella (Scaphella) junonia junonia* (Lamarck, 1804), length 108.0 mm, collected in a crab trap set in 15 m depth off Rabbit Key, Monroe County, Ten Thousand Islands, Florida; **B**= *Scaphella (Scaphella) junonia elizabethae* Petuch & Sargent, 2011, length 110.0 mm, trawled from 50 m depth north of Garden Island, Dry Tortugas, Florida Keys; **C, D**= *Scaphella (Scaphella) junonia glicksteinorum* Petuch & Berschauer, new subspecies, holotype, length 61.7 mm, on clean carbonate sand and living corals, 8 m depth north of Looe Key Reefs, Lower Florida Keys, Monroe County, Florida; **E, F**= *Scaphella (Scaphella) junonia glicksteinorum* Petuch & Berschauer, new subspecies, length 62.5 mm, in a sand pocket on a living coral patch reef, 5 m depth, south of Big Munson Island, Big Pine Key, Monroe County, Florida, in the Petuch collection; **G, H**= *Scaphella (Scaphella) junonia glicksteinorum* Petuch & Berschauer, new subspecies, length 65.0 mm, found freshly-dead on clean carbonate sand, 5 m depth off Pickles Reef, Plantation Key, northern Florida Keys, Monroe County, Florida, in the Berschauer collection.

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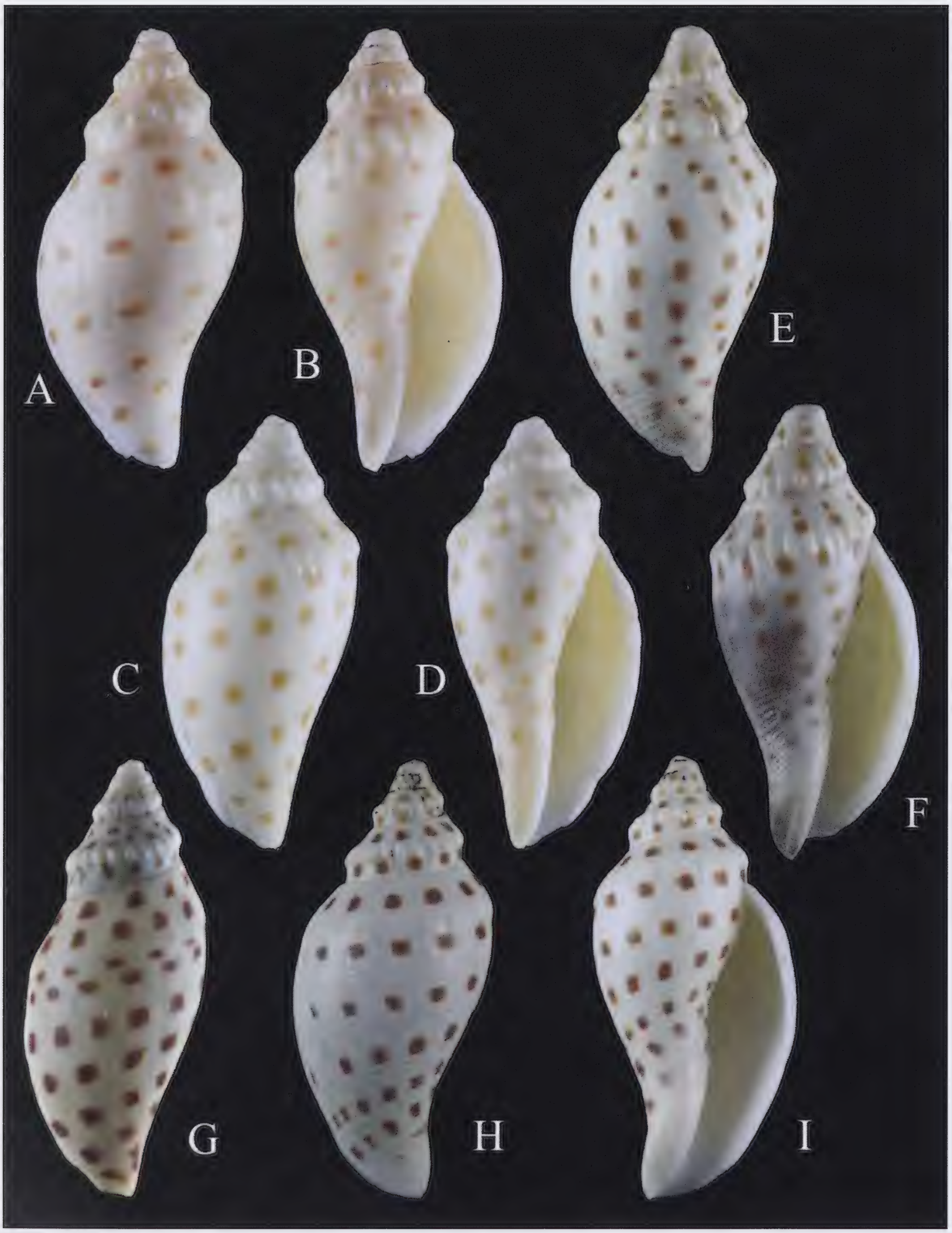

Plate 6. Deep Water *Scaphella (Clenchina)* Volutes from the Straits of Florida.
A, B= *Scaphella (Clenchina) carriae* Petuch & Berschauer, new species, holotype, length 42.0 mm, dredged from 550 m depth southeast of Key Largo, Florida Keys, Monroe County, Florida, by the R/V *Combat* (station 444); **C, D=** *Scaphella (Clenchina) carrieae* Petuch & Berschauer, new species, length 40.0 mm, trawled by deep water shrimpers from 700 m depth in the Straits of Florida south of Key West, Florida, in the Petuch collection; **E, F=** *Scaphella (Clenchina) carrieae* Petuch & Berschauer, new species, length 44.0 mm, trawled from 750 m depth in the Straits of Florida, south of Key West, Florida, in the Berschauer collection; **G=** *Scaphella (Clenchina) florida* (Clench and Aguayo, 1940), length 51.7 mm, collected by a submersible vessel from 262 m depth, off Key Largo, Monroe County, Florida (for comparison with *S. carrieae*); **H, I=** *Scaphella (Clenchina) marionae* Pilsbry and Olsson, 1953, length 48.0 mm, trawled by shrimpers from 400 m depth due west of Sarasota, Florida (for comparison with *S. carrieae*).

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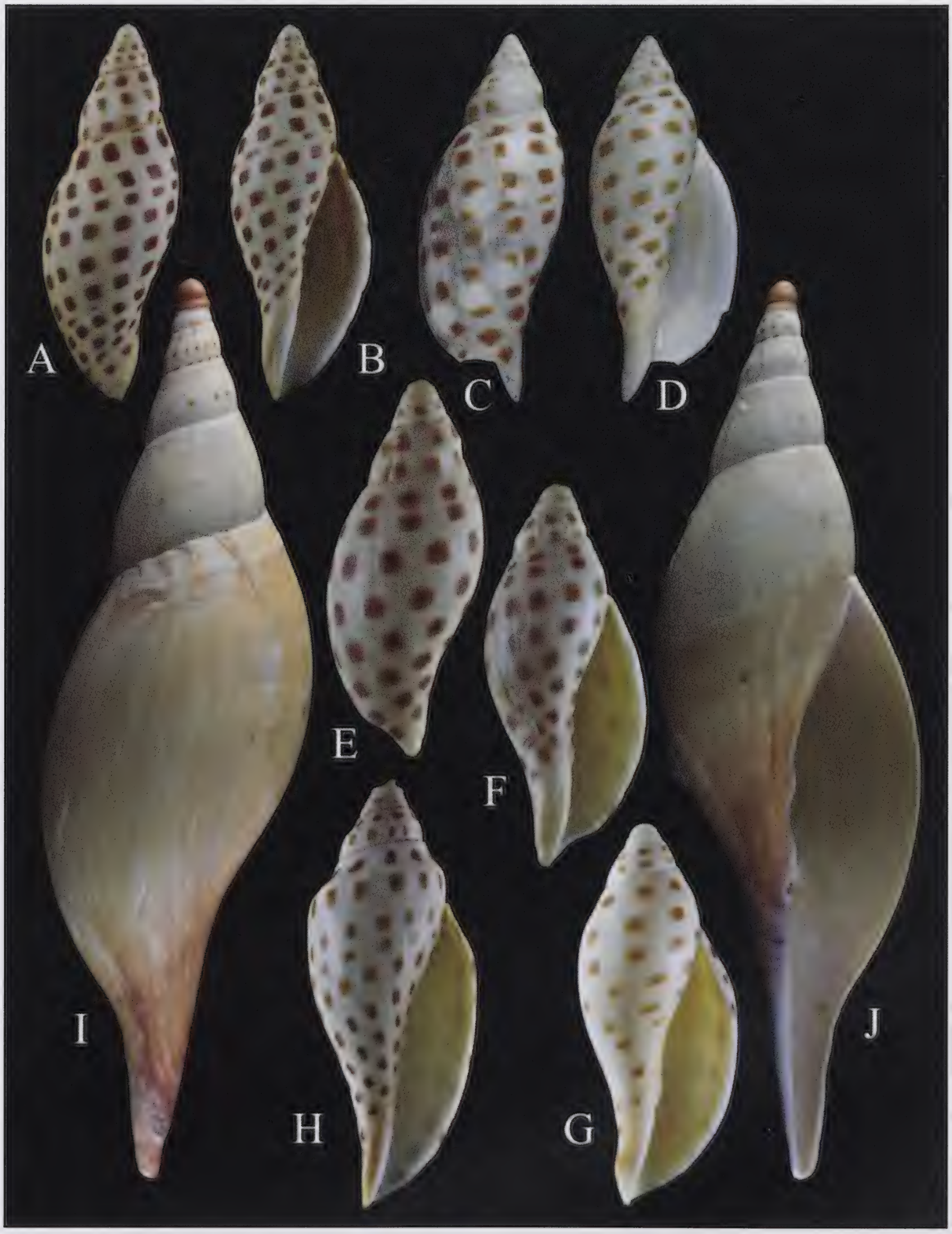

Plate 7. Deep WaterVolutes from Florida and Yucatan.
A, B= *Scaphella (Clenchina) dohrni* (Sowerby III, 1903), length 72.0 mm, trawled by "Royal Red" shrimpers from 300 m depth northwest of the Dry Tortugas, Florida Keys (for comparison with *S. (Clenchina) rundoi*); **C, D**= *Scaphella (Clenchina) rundoi* Petuch & Berschauer, new species, holotype, length 58.0 mm, trawled by shrimpers from 400 m depth NW of the Dry Tortugas, Florida Keys; **E, F**= *Scaphella (Clenchina) rundoi* Petuch & Berschauer, new species, length 40.3 mm, trawled from 350 m depth north of the Dry Tortugas, Florida Keys, in the Berschauer collection; **G**= *Scaphella (Clenchina) rundoi* Petuch & Berschauer, new species, length 41.5 mm, trawled from 400 m depth north of the Dry Tortugas, Florida Keys, in the Petuch collection; **H**= *Scaphella (Clenchina) atlantis* Clench, 1956, length 53.0 mm, trawled by the R/V *Atlantis* (Station 2999) from 421 m depth between Key West, Florida and Matanzas, Cuba (an historically-important specimen from the M.L. Jaume collection, and collected on March 17, 1938; for comparison with *S. rundoi*) **I, J**= *Aurinia (Garciavoluta) mcginnorum* (Garcia and Emerson, 1987), length 213.0 mm, from 300 m depth off Isla Contoy, Quintana Roo State, Mexico (type of the new subgenus *Garciavoluta*).

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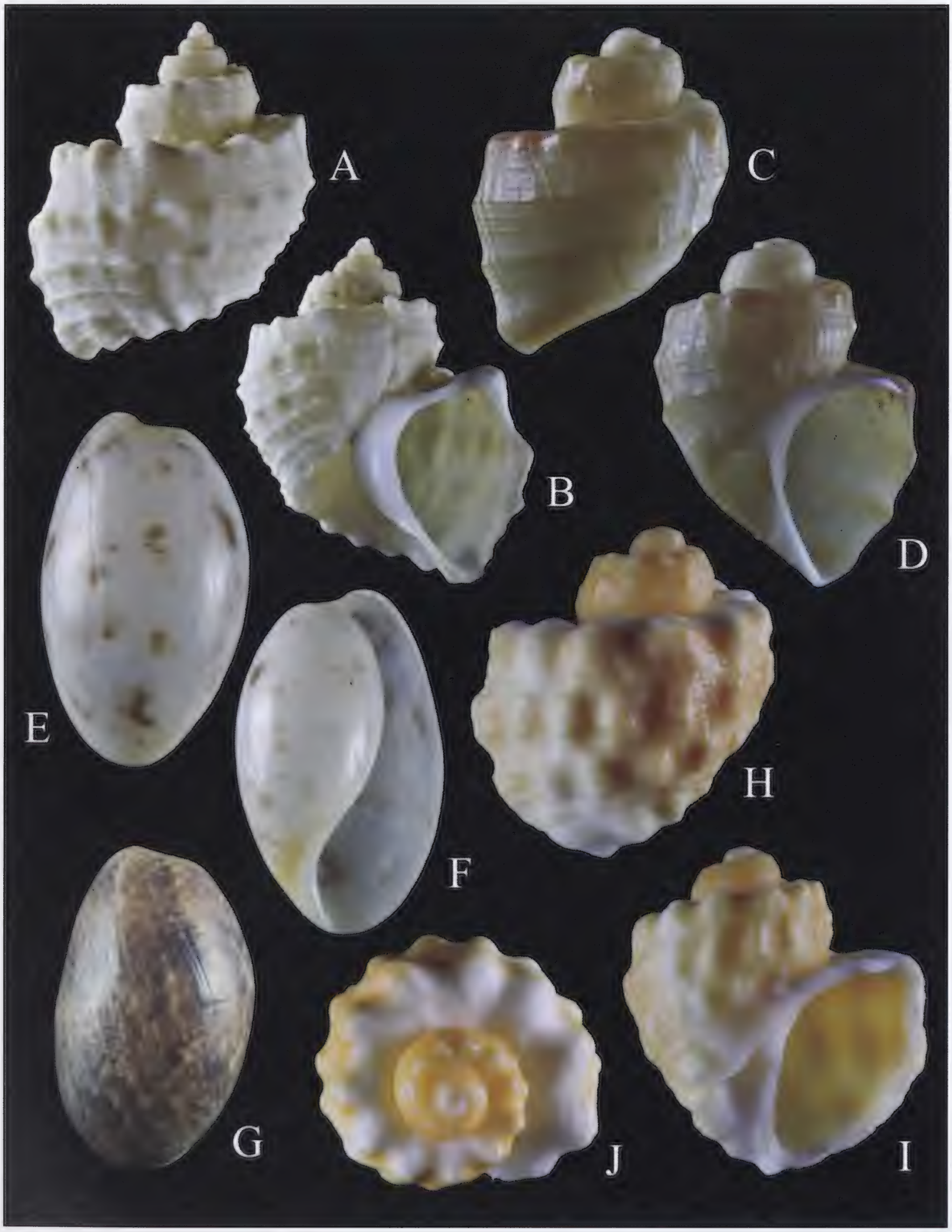

Plate 8. New Gastropods from the Gulf of Mexico.
A, B= *Ventrilia tenerum* (Philippi, 1848), length 23.0 mm, from 100 m depth off Palm Beach, Florida; **C, D**= *Ventrilia xbalanque* Petuch & Berschauer, new species, holotype, length 16.0 mm, 20 m depth off Telchac Puerto, Yucatan, Mexico; **E, F**= *Bulla occidentalis morai* Petuch & Berschauer, new subspecies, length 17.4 mm, holotype, washed onto the beach in Celestun Lagoon, Celestun, Yucatan State, Mexico; **G**= *Bulla occidentalis* A. Adams, 1850, length 27 mm, in sea grass bed, Camp Lulu Key, Collier County, Ten Thousand Islands, Florida (for comparison with *B. occidentalis morai*); **H, I, J**= *Ventrilia jonathoni* Petuch & Berschauer, new species, length 12.0 mm, holotype, washed onto beach at Celestun, Yucatan State, Mexico.

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A Review of the *Relegamoria molleri* Species Complex (Gastropoda: Volutoidea: Volutidae) from Eastern Australia

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ABSTRACT A review of the *Relegamoria molleri* (Iredale, 1936) complex was undertaken using newly sourced material from a number of private research collections and Atlas of Living Australia ("ALA") database, which contains the Australian and Queensland Museums holdings and records. After a detailed review of several hundred specimens including morphological and distributional characters, *Relegamoria* Iredale, 1936 is reinstated at the generic level and the two previously recognised subspecies *R. molleri isabelae* Bail, Limpus & Poppe, 2001 and *R. molleri vandenbergae* Bail, Limpus & Poppe, 2001 are raised to full species and a further nine new species are recognised: *Relegamoria aliuamolleri* new species, *Relegamoria archaeomolleri* new species, *Relegamoria ariae* new species, *Relegamoria elsieae* new species, *Relegamoria charlyi* new species, *Relegamoria barbaracollinsae* new species, *Relegamoria annetteae* new species, *Relegamoria youngorum* new species and *Relegamoria ashleyfieldi* new species. This revision highlights the need for a broader review into the deep-water fauna of Queensland and New South Wales, particularly as more private collections are made available for scientific study.

KEYWORDS Volutidae, *Relegamoria*, *R. molleri, R. isabelae, R. vandenbergae, R. aliuamolleri, R. archaeomolleri, R. ariae, R. elsieae, R. charlyi, R. barbaracollinsae, R. annetteae, R. youngorum, R. ashleyfieldi,* Australia, Citizen Science, Trawler, Collections

INTRODUCTION

There have been several recent papers on Australian Volutidae, particularly from Queensland, South Australia and Western Australia that have demonstrated that many unnamed species remain hidden especially in private collections (Bail, Limpus & Poppe 2001, Bail and Limpus 2003, 2008, 2009, 2011, 2013, 2014, 2015, 2016; van Pel & Moolenbeek 2010; Morrison 2012, 2018, 2023; Cossignani & Allary 2019; Healy 2019; Poppe & Tagaro 2020; Morrison & Schneider 2021; Hallan 2023; Pozzi 2023). Furthermore, historical works often noted novel regional populations without taxonomically recognising them, as often the material at hand was considered inadequate in the authors' eyes to be recognised at the species or subspecies level (Bail, Limpus & Poppe 2001).

Biogeography is an important but often overlooked multidisciplinary field, which is extremely important to understanding the distribution of marine mollusks. Biogeography plays an important role in understanding the *Relegamoria molleri* (Iredale, 1936) complex (previously known as *Amoria molleri* before this paper). The Solanderian Molluscan Province, covers most of the coast of

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Queensland from the Torres Straits in the north to approximately Tweeds Heads just into northern New South Wales and is ecologically dominated by the Great Barrier Reef and its associated island groups, including myriad isolated coral reefs in the western Coral Sea (Petuch & Berschauer 2020). The Solanderian Molluscan Province can be further divided into three distinct subprovinces, the Moretonian Subprovince, the Cairnsian Subprovince, and the Coralian Subprovince, each with its own distinct fauna of endemic molluscan species (Petuch & Berschauer 2020). One of the most characteristic endemic volutid species radiations is known from the Cairnsian Subprovince and includes 12 species and subspecies in the genus *Cymbiola,* which occur along with a large number of other endemic volutid taxa including *Volutoconus multiformis*, *Nannamoria inflata* and *N. gotoi* (Bail, Limpus & Poppe 2001; Petuch & Berschauer 2020). As a result of the Volutidae being characterized by larvae with direct development (without any lecithotropic stage), populations of organisms tend to become separated into isolated genetic pools, which over time lead to speciation (Bail, Limpus & Poppe 2001). The focus of this study, the *Relegamoria molleri* complex, is the result of such a species radiation in this rich and diverse tropical environment.

In this paper, we elevate two subspecies to the rank of species, and describe three new species previously treated as forms, as well as presenting an additional six new species. This paper follows Maxwell *et al.* (2021) in which the rank species is used for morphologically dissimilar organisms and where the subspecific rank is reserved for those organisms that can only be differentiated with the use of genetics. This rejects the historical concept propositioned by Mayr (1982), and replaces that concept with a belief that the practical rationale for erecting species is to generate points of references upon which a clear explanation of the natural world can be grounded (Maxwell *et al.* 2021).

ABREVIATIONS

AWC	Annette Whitney Collection, Sarina, Qld.
BCC	Barbara Collins Collection, Machans Beach, Qld.
BSRF	BlueSky Research Foundation Collection, Yorkeys Knob, Qld.
ARFC	Ashley R. Field Collection, Smithfield, Qld.
CTC	Charly Taylor Collection, Julatten, Qld.
VCC	Valda Cantamessa Collection, Qld.
IIC	Invertebrate Identification Reference Collection, Faulconbridge, NSW.
AMS	Australian Museum, Sydney, NSW.
SH	shell height
SW	shell width

METHODS

Shell specimens from private collections were sought and examined for the purposes of undertaking a review of the *Relegamoria molleri* complex and the identification of potential new species. This material was compared to illustrations of existing type material, and after consideration of the morphological variation, which was contextualised with intraspecific variability and distribution patterns, new taxa were identified and described.

In the determination of distributions of species, consideration was given to the existing literature, although this data was very limited (Bail, Limpus & Poppe 2001), and to the locality data provided with the material under examination.

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Additionally, significant consideration was placed on the nature of the sourcing of the material. In this case, the material was primarily derived from commercial trawling activities. Given the vicissitudes of locational accuracy that inevitably come with extended trawling ventures that often cover a wide area on each trip, the data that is presented with a specimen, may not be location specific but rather regional in nature or represent the home port from which the trawlers operated (Figure 13). Furthermore, the trawl times and topography of the benthos are generally unknown and this can lead to variability in data labels for many specimens.

SYSTEMATICS

Class	Gastropoda Rafinesque, 1815
Infraorder	Neogastropoda Wenz, 1938
Superfamily	Volutoidea Rafinesque, 1815
Family	Volutidae Rafinesque, 1815
Tribe	*Amoriini* Gray, 1857
Genus	*Relegamoria* Iredale, 1936

Relegamoria Iredale, 1936

Redescription. Shells small to large size (SH 40-120 mm) and cylindrical in form. The outer lip is moderately reflected, and there is a flattened edge on the outer lip. Below the edge of the outer lip there is a long axially raised callous. The columella has distinctive irregularly sized plaits (5-7). Protoconch variable, multiwhorled (4+ whorls), straight sided and conical with pointed apex, coloured tan to dark brown and smooth or pale brown with a white suture and with fine spiral striae (7-8 per whorl) and very fine radial striae to small pointed apex, broad, stepped convex whorls, obvious spiral striae and pale white to cream. Body whorl smooth or with very fine radial striae, typically uniform in colour, and or with two rows of short radial stripes of brown.

Synonymy.

Relegamoria Iredale, 1936, p. 314 (Monotypic).
Amoria (*Relegamoria*) Weaver & du Pont, 1970, p. 163.
Amoria Darragh, 1988, p. 224.
Amoria (*Amoria*) Poppe & Goto, 1992, p. 191. Bail, Limpus & Poppe, 2001, p. 30.

Type Species: *Relegamoria molleri* Iredale, 1936 by original designation.

Remarks. This genus differs from other members of *Amoria* Gray, 1855 in having the raised callous centrally inside the aperture and irregular columellar plaits. The protoconch structure differs from the type species of *Amoria*, *A. turneri* (Gray in Griffith and Pidgeon, 1834) which is broad, stepped, multiwhorled (3+), pale cream to white with a smooth white suture. Examination of the protoconch characters of the type species of *A.* (*Amorena*) Iredale, 1929, *A.* (*Zebramoria*) Iredale, 1929 and *A.* (*Cymbiolista*) Iredale, 1929 confirms there are consistent differences which previous authors such as McMichael (1960), Macpherson and Gabriel (1962), Weaver and du Pont (1970), Darragh (1988), and Bail, Limpus & Poppe (2001) have variously treated *Amoria* as a single genus, a genus with one to four subgenera or as full genera. Volutes have separate sexes, and therefore, there is a reasonable probability of sexual dimorphism with the females being larger and possibly broader than the males.

Relegamoria molleri Iredale, 1936
(Figure 1, Plates 1 and 3)

Description. Shell solid, up to 110 mm in length and ovately fusiform. The spire is smooth and brown in colour. Spire whorls are smooth, slightly convex and with distinct sutures. There is often a pale band just below the suture. The body whorl is smooth. The outer lip is centrally

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straightened moderately angled at the anterior, well rounded, and somewhat extended posteriorly. The outer lip joins at the shoulder of the body whorl, and the anterior sinus is shallow. There is a strong callous centrally just below the inner edge. The columellar plaits are typically 4 in number but may vary in size and form. Colour variable form brown through to peach and off while, but uniformly plain, rarely with rows on axial dashes.

Type Material. *Holotype* – AMS C.60699 (SH 76 mm, width 33 mm).

Type Locality. Off Manly, New South Wales, 85 fathoms (Iredale 1936, p. 314)

Synonymy.

Relegamoria molleri Iredale, 1936, p. 314, pl. 23, fig. 10.

Amoria (*Amoria*) *molleri molleri* Bail, Limpus & Poppe, 2001, p. 30, pl. 50.

Distribution. Cape Moreton, Queensland south to Sydney, New South Wales at depths between 145 - 180 meters state range based on the material we have examined and on ALA.

Material Examined. Cape Moreton (6 x VCC; 5 x JRC); Of Mooloolaba (3 x VCC; 11 x AWC); Northern New South Wales (1 x VCC); Moreton Bay (3 x VCC), S. of Double Island Point, S. of K'gari Island (1 x IIC S.4176).

Remarks. *Relegamoria molleri* can be differentiated by its straight outer lip and a strong, elongated and narrow callous on the inner aperture when compared to *R. ariae,* which has a rounded and less calloused inner lip. The posterior outer lip of *R. molleri* is more quadrate than *R. isabelae*, which is more elongated. The sharp spire of *R. molleri* differs from the bulbiformed and entirely calloused spire that is typical with adult *R. annetteae*. The left ventral side of *R. molleri* is rounded and lacks the concave anterior third found in *R. vandenbergi* and *R. aliuamolleri.* The higher spire and more fusiform shell of *R. molleri* distinguishes this species from the quadrate shell and blunt spire of *R. elsieae.*

Figure 1. The holotype of *Relegamoria molleri* Iredale, 1936 (SH 76 mm, SW 33 mm) (AMS C.60699).

Relegamoria isabelae (Bail, Limpus & Poppe, 2001)
(Figure 2, Plates 1 and 4)

Description. Shell elongated, narrow almost cylindrical, reaching up to 120 mm in length. The spire is acute, high and smooth. The upper outer lip is strongly quadrate anteriorly, and moderately extended and well-rounded posteriorly. The central outerlip is straight and the central callous is short but well-defined just below the inner edge. The anterior sinus is moderately shallow with the side formed by the outerlip tending to be acute. The columellar plaits are variable in number and strength of form, The colour is typically light peach, but maybe white and yellow, with two rows of distinct axial dashes on the body whorl and some small lines below the sutures.

Type Material. *Holotype* – AMS, C.204771 (SH 112.5 mm).

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Type Locality. Trawled between 210 - 220 meters off Hixson Cay (Bail, Limpus & Poppe 2001, p. 32).

Synonymy.

2001 *Amoria* (*Amoria*) *molleri isabelae* Bail, Limpus & Poppe, p. 32, fig. 8, pl. 54.

Distribution. Off Southern Swain Reefs between 200- 250 meters on gray muddy sand (Bail, Limpus & Poppe 2001, p. 32).

Material Examined. Off Swain Reefs (2 x VCC); Hixson Cay (1 x VCC; 3 x AWC, 1 x S.4163 IIC).

Figure 2. The holotype of *Relegamoria isabelae* (Bail, Limpus & Poppe, 2001) (SH 112.5 mm) (AMS, C.204771).

Remarks. The shell of *R. isabelae* can be differentiated from *R. youngorum* by the elongated and high spire of the shell. The aperture of *R. isabelae* is narrower than its sister taxa *R. elsieae* and *R. ariae*. The shell of *R. isabelae* is also much larger than *R. aliuamolleri* and the much rarer *R. charlyi*.

Note on the original holotype labels of this species and the following one, the authorship is given as Bail, Limpus & Poppe. On the second page of their publication, the original German library registration, the authorship of the paper is given as Bail, Limpus & Poppe. The authors indicate that the text is written by Bail & Limpus and the illustrations *etc.* are by Poppe. However, where the new subspecies and form names are introduced the authors do not state that the authorship is Bail & Limpus as such: they just simply put either n. forma or n. ssp, and therefore, the authorship should be Bail, Limpus & Poppe.

Relegamoria vandenbergae (Bail, Limpus & Poppe, 2001)
(Figure 3, and Plates 2 and 5)

Description. Shell solid, heavy, up to 70mm in length and somewhat falcate in form. The protoconch is pointed sitting atop the spire. The spire is short, somewhat triangular, with a convex side. The body whorl is rounded. The outerlip is rounded and there is a weak callosity centrally just below the inner edge. The columellar plaits are irregular in number and form. Varying in colour from peach to off-white.

Type Material. *Holotype* – AMS, C.204770 (SH 71.3 mm).

Type Locality. Off Pith Reef at a depth of 300 meters (Bail, Limpus & Poppe, 2001, p. 33).

Synonymy.

2001 *Amoria* (*Amoria*) *molleri vandenbergae* Bail, Limpus & Poppe, 2001, p. 33, fig. 9, pl. 55.

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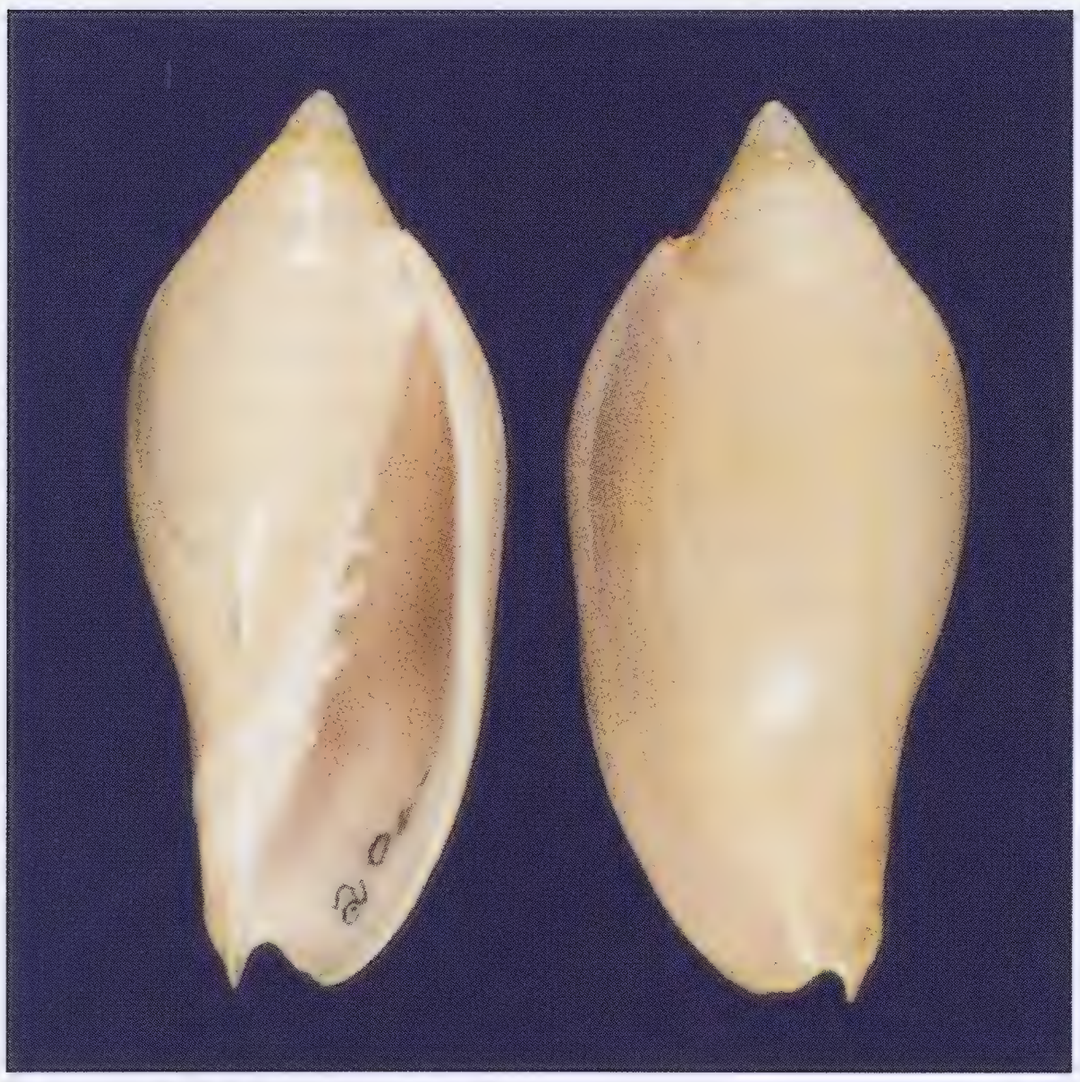

Figure 3. The holotype of *Relegamoria vandenbergae* (Bail, Limpus & Poppe, 2001) (SH 71.3 mm) (AMS C.204770).

Distribution. Off Pith Reef Between 300-320 meters (Bail, Limpus & Poppe, 2001, p. 33).
Material Examined. Off Pith Reef (VCC; 1 x AWC); off Mackay (1 x AWC).
Remarks. One of two species found in far North Queensland, *R. vandenbergae* is more ovate and with a less developed callous and lacks the flaring outer lip of the sister taxa, *R. ashleyfieldi*, the outer lip of which is flaring. Furthermore, *R. vandenbergae* is smaller than *R. ashleyfieldi* which also has a strong raised ridge prior to the formation of the outer lip that is less developed to obsolete in *R. vandenbergae*.

Relegamoria aliuamolleri Maxwell & Berschauer, new species
(Figure 4, Plates 1 and 8)

Description. The light weight shell is somewhat falcate in form, up to 60 mm in length. The protoconch is slightly raised and the apex is rounded. The spire is smooth and is variable in height ranging from short to moderately elongated. The body whorl is smooth without ornamentation. The outer lip is rounded and joins at the shoulder where it is angular and does not extend past the sinus. The posterior sinus is moderately deep. There is a moderate narrow callosity that is just below the outer lip. The columellar plaits vary from four to five, with the central plaits being the largest. The shell is coral peach to peachy orange and has three rows of axial lines: the first just below the sutures; the second at the shoulder; and the third on the lower half of the shell.

Figure 4. *Relegamoria aliuamolleri* n. sp. Holotype – Trawled off North Reef, BSRF TC018 (SH 53 mm, SW 21 mm) [ex CTC].

Type Material. *Holotype* – Trawled 145 meters off North Reef, deposited in the BlueSky Research Foundation Collection, no. TC018 (SH 53 mm, width 21 mm). *Paratype* 1 – trawled off North Reef, CTC (50 mm). *Paratype* 2 – trawled off North Reef, CTC (SH 52 mm). *Paratype* 3 – trawled off North Reef, CTC (SH 50 mm). *Paratype* 4 – trawled Swain Reefs, CTC (54.5 mm). *Paratype* 5 – trawled Swain Reefs, 200 meters, VCC (SH 45.7 mm).

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Paratype 6 – trawled east of Bundaberg, VCC (56.4 mm). *Paratype* 7 – trawled off Capricorn Group, ARFC no. 1624 (SH 45.8 mm). *Paratype* 8 – trawled off Lady Elliot Island, ARFC no. 1623 (SH 50 mm). *Paratype* 9 – trawled off North Reef, S.35627 IIC (SH 45.8 mm). *Paratype* 10 – S.35582, off Swain Reefs IIC (SH 49.4 mm).

Type Locality. Trawled 145 meters off North Reef, Queensland.

Synonymy.

2001 *Amoria* (*Amoria*) *molleri molleri* forma *reducta* Bail, Limpus & Poppe, 2001, p. 31, pl. 52.

Distribution. The northern Capricorn Group to the southeast of the Swain Reefs at a depth around 140-160 meters (Bail, Limpus & Poppe 2001).

Etymology. A compound from the Latin *aliua* (= another) and "molleri" and named to reflect is historical taxonomic association with *R. molleri*.

Remarks. Bail, Limpus & Poppe (2001) first identified *R. aliuamolleri* as a dwarf form of *R. molleri*. This species is much smaller than the other members of the complex, except *R. charlyi*, but differs from that species in having a more acute posterior aperture and not as well developed columellar plaits. However, notwithstanding size differences, the *R. aliuamolleri* differs from *R molleri* in the more fusiform shape, lacks the strong central callosity that is so distinctive in that species.

Relegamoria annetteae Maxwell & Berschauer, new species
(Figure 5, Plates 1 and 8)

Description. The shell is solid, moderately large and fusiform in shape, up to 100 mm in length. The spire is moderately tall, and the apex is acute with a blunted protoconch. The spire whorls are moderately convex with indistinct sutures, smooth and with a glossy polished appearance. The body whorl is anteriorly inflated with a well-defined shoulder, and when viewed ventrally is triangulate with straight sides. The outerlip is centrally straight with a prominent callous. The posterior sinus is shallow and the outerlip joins where the sinus terminates. There are three or four columella plaits that are not strongly developed. The shell is peachy with a glossy appearance and three rows of numerous even axial lines that may have a smudged appearance.

Type Material. *Holotype* – Deposited in the BlueSky Research Foundation Collection, no. TC019 (SH 89 mm, width 37 mm). *Paratype* 1 – trawled off K'gari, BCC (SH 97.5 mm). *Paratype* 2 – trawled off K'gari, BCC (SH 105 mm). *Paratype* 3 – trawled off K'gari, BCC (SH 82 mm). *Paratype* 4 – off Moololabah, CTC (82.5 mm slightly juvenile). *Paratype* 5 – off Bundaberg S.35581 IIC (juvenile SH 79.1 mm). *Paratype* 6 – off K'gari, VCC (93.1 mm).

Figure 5. *Relegamoria annetteae* n. sp. Holotype – trawled off K'gari, BSRF TC019 (SH 89 mm, SW 37 mm) [Ex CTC].

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Type Locality. Trawled east of K'gari 140-160 meters.

Synonymy.

2001 *Amoria* (*Amoria*) *molleri molleri* forma *capricornica* Bail, Limpus & Poppe, p. 31, pl. 51, fig. 1.

Distribution. Ranges from south of Lady Musgrave Island to the southern areas of K'gari.

Etymology. Named in honour of Annette Whitney for her contribution to the Whitsunday, Townsville and Proserpine Shell Clubs and her encouragement of young shell collectors.

Material Examined. Off K'gari (2 x AWC).

Remarks. A beautiful, large and well calloused member of the *Relegamoria*, *R. annetteae* differs from *R. molleri*, *R. elsieae* and *R. ariae* in having a triangulate spire that is often bulbous, entirely calloused. Furthermore, *R. annetteae* is much narrower anteriorly than other members of the *Relegamoria* such as *R. molleri* and *R. elsieae*. The shell of *R. annetteae* lacks the concave left dorsal side that is typical with *R. aliuamolleri*. The form of the outer lip of *R. annetteae is* straight rather than being recurved as in *R. ariae*.

Relegamoria archaeomolleri Maxwell & Berschauer, new species
(Figure 6, and Plate 1)

Description. The smooth shell is fusiform, solid and moderately large, up to 80 mm in length, with a high spire. The protoconch is slightly raised and the apex of the shell is rounded. Spire whorls becoming more convex with growth forming a distinctive shoulder on the body whorl. There is a raised axial nodule on the shoulder just before the commencement of the outer lip. The outer lip is somewhat reflected and there is a strong axial callous just below the edge. The outer lip is rounded and rises to meet the shoulder where it forms the border of the sinus, but does not extend past it. The columellar plaits are irregular and few in number.

Type Material. *Holotype* –Deposited in the BlueSky Research Foundation Collection, no. TC021 (SH 78 mm, width 36 mm).

Type Locality. The Bunker Islands, 205-215 meters.

Distribution. Known only from a subfossil taken from the trawling grounds off the Bunker Islands.

Etymology. The name is derived from the Latinised form of the Greek *ἀρχῆ* (beginning) and "molleri" denoting it as one of the progenitors of *R. molleri*.

Remarks. Known from a subfossil, *R. archaeomolleri* differs from others in the complex in having a high spire and raised lump on the shoulder before the outer lip. The posterior of the outer lip is not quadrate or acute as found in *R. molleri*, *R. ariae*, *R. elsieae* or *R. annetteae*, being angled anteriorly and not forming the distinctive raised border at the posterior sinus as in other members of the complex.

Figure 6. *Relegamoria archeomolleri* n. sp. Holotype – Trawled Bunker Group, 205-215 meters, BSRF TC021 (SH 78 mm, SW 36 mm) [ex CTC].

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Relegamoria ariae Maxwell & Berschauer, new species
(Figure 7, Plates 1, and 6)

Description. The large sized heavy shell, up to 100 mm in length, is cylindrical and fusiform, with a rounded aperture lip and short but conical spire. The protoconch is slightly raised and the distinct sutures are moderately incised. The spire whorls are smooth. The body whorl is bulbus without a distinctive axial ridge before the formation of the outer lip. The outer lip is rounded. Columellar plaits variable in form but typically are four, but may be diminished to absent. The posterior sinus is well developed and the outer lip forms border that extends past the sinus where it is acute, sharp and parallel to the spire. Colour is uniformly coral to light tan/cream with three rows of axially thin irregular brown lines: the first running out from just below the suture, the second on the shoulder of the body whorl and the third row on the lower third of the shell.

Type Material. *Holotype* – Deposited in the BlueSky Research Foundation Collection, no. TC014 off Lady Elliot Island, CTC (SH 68 mm). *Paratype* 1 – off northern K'gari (locality uncertain), BCC (SH 102 mm). *Paratype* 2 – off northern K'gari (locality uncertain), BCC (SH 71 mm). *Paratype* 3 – Lady Musgrave Island ARFC no. 4886 (SH 99.1 mm).

Type Locality. Off Lady Elliot Island, at 180 meters.

Synonymy.

2001 *Amoria* (*Amoria*) *molleri molleri* forma *capricornica* Bail, Limpus & Poppe, p. 31, pl. 51, figs. 3, 4, 6 & 7.

Distribution. Off Lady Musgrave and the Bunker Group in 180-250 meters of water (Bail, Limpus & Poppe 2001, p. 31).

Etymology. Named after Aria Taylor, the granddaughter of Charly Taylor who provided the type material for this study.

Remarks. *R. ariae* can be differentiated from the similarly coloured and patterned *R. elsieae,* which is larger and of quadrate shape. *R. isabelae* is smaller and less elongated and has a finer inner callous. *R. annetteae* differs in being darker and more calloused and heavier, and from other *Relegamoria*, being much more rotund, which is contrasted with the similarly coloured and patterned *R. elsieae,* the shell of which has straight sides, or *R. annetteae,* which is biconic in structure. The smaller *R. aliuamolleri* is much more fusiform than the new species.

Figure 7. *Relegamoria ariae* n. sp. Holotype – Lady Elliot Island BSRF TC014 (SH 68 mm, SW 29 mm) [ex CTC].

Relegamoria ashleyfieldi Maxwell & Berschauer, new species
(Figure 8, Plates 2 and 7)

Description. The shell is heavy, up to 100 mm in length, wide and ovate. The protoconch is slightly elevated. The spire varies in height, but typically is moderately high, and somewhat acute. The spire whorls are slightly convex and there is a slight concave ramp leading to the

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shoulder. The sutures are defined and there is no sculpture on the whorls. The body whorl is inflated at the shoulder. The outer lip is reflected and broadly flared, with a well-defined axial callous before the commencement of the flaring lip. The columellar has typically seven irregular plaits the central being the largest. The colour is peach with two rows of faint axial lines and a third row of irregular lines below the suture.

Type Material. *Holotype* – Deposited in the BlueSky Research Foundation Collection, no. TC022 (SH 78 mm, width 36 mm). *Paratype* 1 - North of Pith Reef, 280-300 meters, ARFC no. 5022 (SH 93.6 mm). *Paratype* 2 - North of Pith Reef, 280-300 meters, BCC (SH 71 mm); *Paratype* 3 - North of Pith Reef, 280-300 meters, BCC (SH 86 mm).

Figure 8. *Relegamoria ashleyfieldi* n. sp. Holotype – North of Pith Reef 280-300 meters, BSRF TC022 (SH 78 mm, SW 36 mm) [ex CTC]

Type Locality. 50 km North of Pith Reef, Queensland.

Distribution. Found between 280-300 meters in the Pith Reef area.

Etymology. Named in honour of Dr. Ashley Field for bringing this new species to the authors' attention.

Remarks. *R. ashleyfieldi* is a large species and along with the similarly coloured but smaller species *R. vandenbergae* are the only currently recognised members of the genus found in far north Queensland. In addition, it differs from the other species recognised here by its large size, shape and broadly reflected outer lip. The rounded, but angulate, shoulder of *R. ashleyfieldi* as well as the reflected and broadly flared outer lip of that species differentiates it from *R. vandenbergae*.

Relegamoria barbaracollinsae Maxwell & Berschauer, new species
(Figure 9, and Plate 2)

Description. The shell is medium sized, up to 85 mm in length, heavy, solid and ovate with a flared outer lip. The protoconch is blunt and the top of the shell is rounded. the sutures of the spire are well defined and there are fine axial subsutural incised growth lines, which do not extend to the shoulder of the shell. The outer lip is thickened and flattened at the edge with a strong axial callosity centrally. The posterior sinus is moderately deep, and the outer lip is rounded and thickened. There are six well defined and somewhat uniform columellar plaits. The shoulder is well defined. Shell colouration is uniformly peachy with very indistinct axial lines in three rows, the first below the suture, the second below the shoulder and the third on the lower third of the shell.

Type Material. *Holotype* – Deposited in the BlueSky Research Foundation Collection, no. TC017 (SH 81.5 mm, SW 45 mm).

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Type Locality. Outside Barrier Reef, off Mackay, 200 meters.

Distribution. This species is from the northern end of the Swain Reefs and has been taken by trawlers operating in that region whose data is often vague.

Etymology. Named in honour of Barbara Collins for her work in supporting research and up and coming collectors globally.

Figure 9. *Relegamoria barbaracollinsae* n. sp. Holotype – Trawled outer reef off Mackay, 200 meters, BSRF TC017 (SH 81.5 mm, SW 45 mm) [ex CTC].

Remarks. *R. barbaracollinsae*, is currently only known from the holotype and is most similar to *R. ashleyfieldi,* which is larger and to *R. vandenbergae,* which is smaller but differs from other *Relegamoria* in being quadrate, with a wide flaring reflected outer lip. The flaring outer lip is much straighter than that of *R. vandenbergae*, and the acuteness of the posterior outer lip of *R. ariae* and *R. youngorum* differentiates those species from *R. barbaracollinsae*.

Relegamoria charlyi Maxwell & Berschauer, new species
(Figure 10, and Plate 2)

Description. The small shell, up to 50 mm in length, is fusiform and elongated with a high protoconch. The outer lip is posteriorly straight becoming curved anteriorly. The spire and body whorls are smooth, giving the shell a reflective white polished look. The sutures are indistinct and shallow. The posterior of the outer lip is rounded and blunt ending at the shallow sinus. The edge of the outer lip is somewhat reflected forming a narrow labial fattened area that phases anteriorly. There is a slight axial callosity midway along the length just inside the aperture. The columellar plaits are variable in size and number six on the holotype, the central plaits being distinctly larger than the others. The colour is off white without pattern.

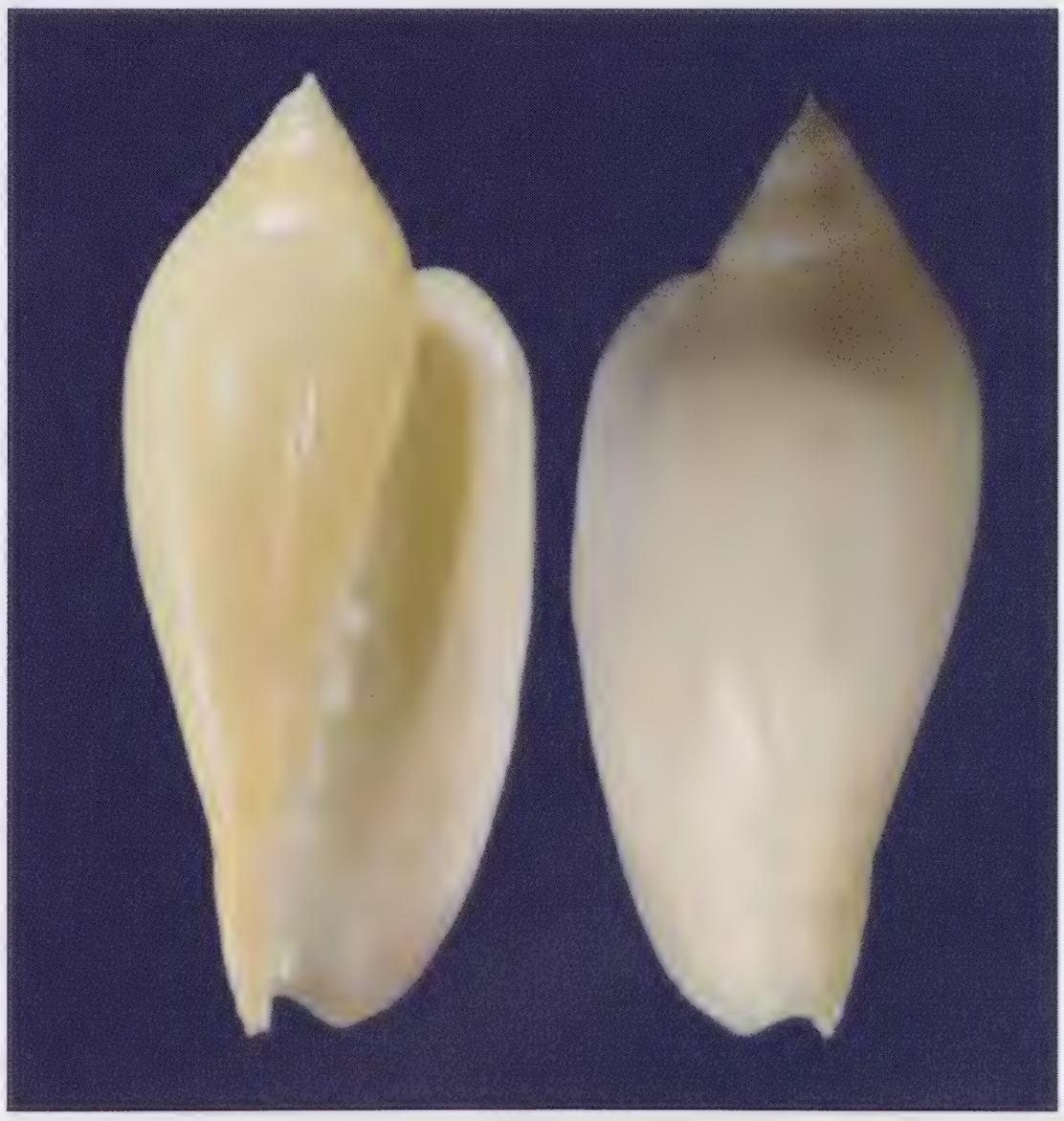

Figure 10. *Relegamoria charlyi* n. sp. Holotype – East of Swain Reefs, BSRF TC016 (SH 50 mm, SW 21 mm) [ex CTC].

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Type Material. *Holotype* – Deposited in the BlueSky Research Foundation Collection, BSRF TC016 (SH 50 mm, SW 21 mm) [ex CTC].

Type Locality. Deep water, below 240 meters, between the Swain Reefs and South West Cay systems.

Distribution. This species is restricted to the deep waters to the east of the Swain Reefs near the South West Cay system and was collected by a deep water research vessel.

Etymology. Named for Charly Taylor who provided the type material for this study.

Remarks. *R. charlyi* is currently only known from the holotype but is most similar in size to *R. aliuamolleri,* which has a more rounded posterior outer lip and different colouration from that species. While similar in colour, being white, the outer lip and heavier shell of *R. youngorum* enables these two species to be differentiated.

Relegamoria elsieae Maxwell & Berschauer, new species
(Figure 11, Plates 1 and 6)

Description. The overall shape of this medium sized, up to 100 mm in length, heavy shell is cylindrical and mucronate. The aperture lip is distinctively straight. The protoconch is short and raised. The spire whorls are not ornamented, and the sutures are distinct. The body whorl is smooth, with a distinctive axial ridge prior to the formation of the outer lip. The inside edge of the outer lip has a callosity that forms a ridge that is centrally developed and somewhat pinched axially. Columellar plaits are typically five in number, with the first two smaller than the others. The posterior sinus is moderately wide with the upper outer lip forming a sharp rounded border that is reflected. Colour is uniformly coral peach with three rows of axially thin irregular brown lines: the first just below the suture, the second on the shoulder of the body whorl and the third on the lower third of the shell.

Type Material. *Holotype* – Deposited in the BlueSky Research Foundation Collection, no. TC015 (SH 77 mm, SW 32 mm). *Paratype* 1 – Trawled off Lady Elliot Island, BCC (SH 84 mm). *Paratype* 2 – Trawled off Lady Elliot Island, BCC (SH 95 mm). *Paratype* 3 – Lady Elliot Island, BCC (SH 81.0 mm). *Paratype* 4 – Lady Musgrave Island ARFC no. 4886 (SH 90.8 mm).

Figure 11. *Relegamoria elsieae* n. sp. Holotype – Trawled off Lady Elliot Island, BSRF TC015 (SH 77 mm, SW 32 mm) [ex CTC].

Type Locality. Off Lady Elliot Island and the area of north K'gari, at 180 meters.

Synonymy.

2001 *Amoria* (*Amoria*) *molleri molleri* forma *capricornica* Bail, Limpus & Poppe, p. 31, pl. 51, figs. 2 and 5.

Distribution. Northern Capricorn Channel at depths between 180-250 meters (Bail, Limpus & Poppe 2001, p. 31)

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Etymology. Named after Elsie Taylor, the granddaughter of Charly Taylor who provided the type material for this study.

Remarks. Differentiated from others in the *Relegamoria* complex, *R. elsieae* has a short spire and much straighter sides of the body and outer lip than *R. ariae or R. annetteae*. The shell of *R. elsieae* lacks the gloss of *R. annetteae* or *R. charlyi*. *Relegamoria eliseae* does not have the broad flaring lip that is found in *R. archeomolleri*, *R. barbaracollinsae* or *R. ashleyfieldi*.

Relegamoria youngorum Maxwell & Berschauer, new species
(Figure 12, and Plate 2)

Description. The ovate shell is glossy and moderately large, up to 70 mm in length. The protoconch is moderately raised, and the apex is blunted. Early whorls of the spire are convex becoming less so as they develop. The shoulder of the body whorl is rounded. There is no sculpture on the spire or body whorl. The outerlip is rounded and there is a moderate callosity centrally just below the edge. The irregular columellar plaits vary in number ranging up to eight. The posterior sinus is shallow and moderately wide with the outerlip extending past n angular and somewhat thin lip. The colour is uniform and peachy to off white.

Type Material. *Holotype* – Deposited in the BlueSky Research Foundation Collection, no. TC020 (SH 68 mm, SW 31 mm).

Type Locality. Trawled east of the Swain Reefs.

Synonymy.

2001 *Amoria* (*Amoria*) *molleri molleri* forma *succincta* Bail, Limpus & Poppe, p. 32, pl. 53.

Distribution. Found between 140-180 meters along the eastern Swain Reefs (Bail, Limpus & Poppe 2001).

Etymology. Named in honour of Trevor and Marguerite Young for their support and commitment to the fostering of young malacologists and service to the Townsville Shell Club.

Figure 12. *Relegamoria youngorum* n. sp. Holotype – Off Swain Reefs 120 meters, BSRF TC020 (SH 68 mm, SW 31 mm) [ex CTC]

Remarks. The sharp top of the posterior outer lip shell of *R. youngorum* differs from other *Relegamoria* such as *R. charlyi* and *R. ashleyfieldi,* which are rounded. The shell of *R. youngorum* has a short spire and is ovate, which differentiates it from the neighbouring sister taxa *R. isabelae,* which is more elongated and with a higher spire.

DISCUSSION

As more private collections are made accessable for scientific study, new material becomes available that illuminates the true variability and regionality of what was once considered to be a single species and later proves to be a species complex. This work highlights the benefits of citizen scientist collectors in providing these

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insights, and generously making material available for study to the professional taxonomic community with the opportunity to bring new species to the attention of other researchers and the wider collecting community.

In addition, we want to highlight the importance of accurate locality information and where possible preservation of the animal as it is clear that many of the taxa currently recognised in this study are closely related. However, there is quite a bit of variation in the protoconch amongst the above species and it will require additional material and access to the animals to determine if the observed differences require additional generic of subgeneric recognition and how they relate to the *Amoria* as a whole.

We also think that the following Western Australian species *A. rinkensi* Poppe, 1986 and *A. diamantina* Wilson, 1972 might also belong in *Relegamoria*, and work on this is continuing. Furthermore, there are fine microsculpture differences in the protoconch between members of the *Relegamoria,* which alludes to the need for a greater revision of the *Amoria* complex.

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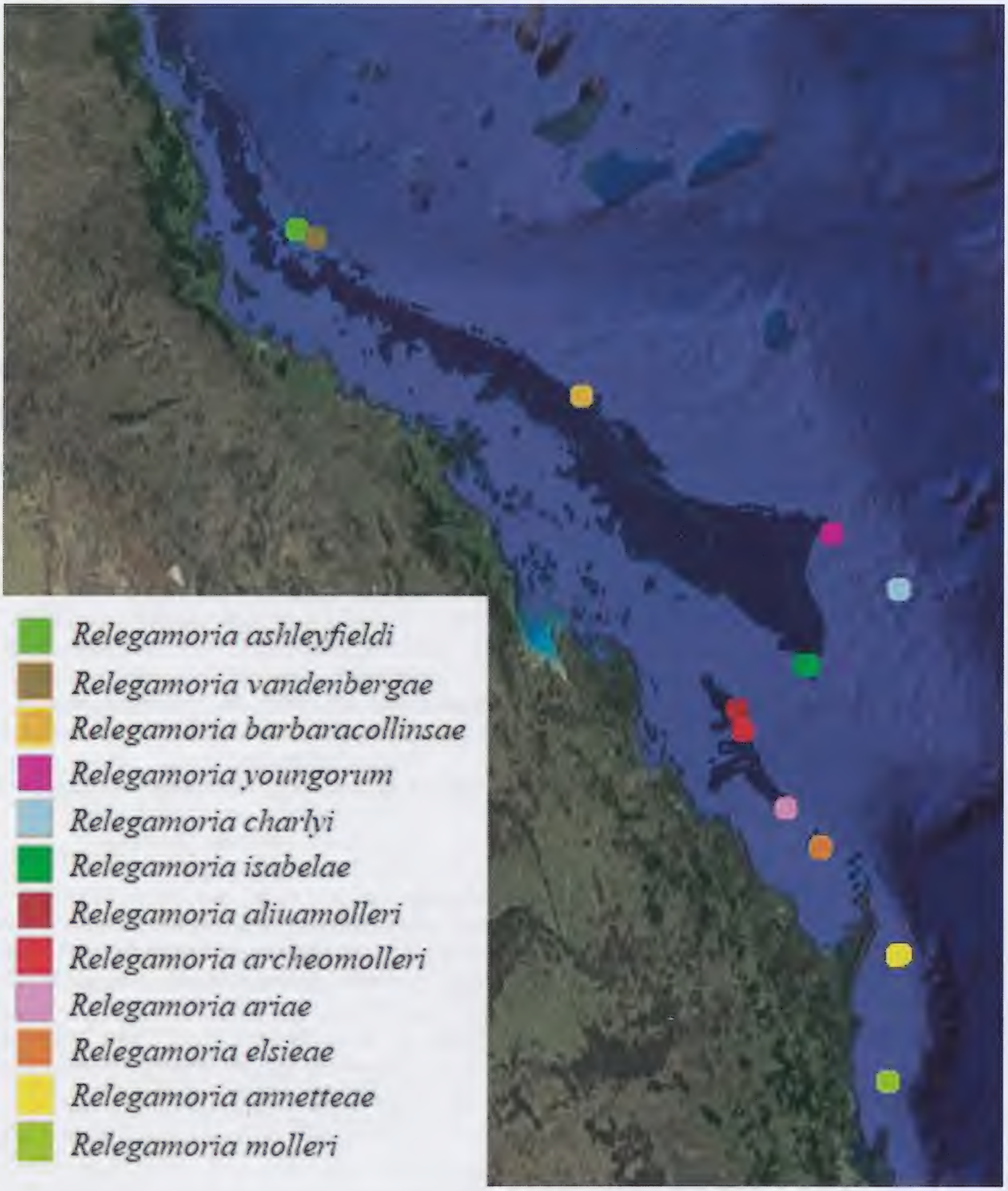

Figure 13. Map of type locations for Queensland *Relegamoria* Iredale, 1936 and an example of the northern range of *R. molleri* Iredale, 1936.

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Plate 1. A comparative overview of *Relegamoria* Iredale, 1936 from Queensland: **A**= *Relegamoria isabelae* (Bail, Limpus & Poppe, 2001) Capricorn Channel, CTC (SH 108.0 mm); **B**= *Relegamoria elsieae* n. sp. Holotype – Trawled off Lady Elliot Island, BSRF TC015 (SH 77 mm); **C**= *Relegamoria ariae* n. sp. Holotype – Trawled off Lady Musgrave Island BSRF TC014 (SH 68 mm); **D**= *Relegamoria aliuamolleri* n. sp. Holotype – Trawled off North Reef, BSRF TC018 (SH 53 mm); **E**= *Relegamoria annetteae* n. sp. Holotype – trawled off K'gari, BSRF TC019 (SH 89 mm); **F**= *Relegamoria archeomolleri* n. sp. Holotype – Trawled Bunker Group, 205-215 meters, BSRF TC021 (SH 78 mm); **G**= *Relegamoria molleri* (Iredale, 1936) Off Cape Moreton, ARFC (SH 94.1 mm).

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Plate 2. A comparative overview of *Relegamoria* Iredale, 1936 from Queensland: **A**= *Relegamoria youngorum* n. sp. Holotype – Off Swain Reefs 120 meters, BSRF TC020 (SH 68 mm); **B**= *Relegamoria barbaracollinsae* n. sp. Holotype – Trawled off the outer reef off Mackay, 200 meters, BSRF TC017 (SH 81.5 mm); **C**= *Relegamoria ashleyfieldi* n. sp. Paratype 1 – North of Pith Reef 280-300 meters, ARFC no. 5022 (SH 93.6 mm); **D**= *Relegamoria charlyi* n. sp. Holotype – East of Swain Reefs, BSRF no. TC016 (SH 50 mm); **E**= *Relegamoria vandenbergae* (Bail, Limpus & Poppe, 2001) ARFC no. 4916 (SH 69 mm).

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Plate 3. Comparative plate of *Relegamoria molleri* Iredale, 1936: **A**= Off Cape Moreton, CTC (99 mm); **B**= Off Cape Moreton, CTC (101 mm); **C**= Off Cape Moreton, CTC (SH 96.5 mm); **D**= Off Cape Moreton, 140-160 meters, ARFC no. 3270 (SH 97.1 mm); **E**= Moreton Bay, VCC (89.7 mm); **F**= off Cape Moreton, BCC (SH 72 mm); **G**= Tweed Heads, BCC (SH 79 mm); **H**= Off Cape Moreton, 140-160 meters, ARFC no. 0561 (SH 94.1 mm).

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Plate 4. Comparative plate of *Relegamoria isabelae* (Bail, Limpus & Poppe, 2001): **A**= Hixson Cay, CTC (SH 95.5 mm); **B**= Hixson Cay, CTC (SH 89 mm); **C**= Off Swain Group, CTC (SH 101 mm); **D**= Hixson Cay, BCC (SH 114 mm); **E**= Capricorn Channel, CTC (SH 108 mm); **F**= Off Swain Reefs, BCC (SH 81 mm); **G**= Off Swain Reefs, VCC (SH 82.7 mm); **H**= Hixson Cay, BCC (SH 104 mm); **I**= Hixson Cay, VCC (SH 96.2 mm); **J**= Off Swain Reefs, 240 meters, VCC (SH 85.1 mm); **K**= Off Swain Reefs, VCC (SH 82.7 mm).

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Plate 5. Comparative plate of *Relegamoria vandenbergae* (Bail, Limpus & Poppe, 2001): **A**= Off Pith Reef, CTC (SH 68.5 mm); **B**= Paratype 4 – Off Pith Reef, CTC (SH 51 mm); **C**= Off Townsville, BCC (SH 65.5 mm); **D**= North of Pith Reef, 280-300 meters, ARFC no. 4915 (SH 62 mm). **E**= Off Pith Reef, VCC (SH 64.9 mm); **F**= Off Pith Reef, CTC (SH 69 mm); **G**= Off Pith Reef, BCC (SH 59 mm); **H**= North of Pith Reef, 280-300 meters, ARFC no. 4916 (SH 69 mm).

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Plate 6. Comparative plate showing the variability of *Relegamoria elsieae* n. sp.; **A**= Paratype 1 – Trawled off Lady Elliot Island, BCC (SH 84 mm); **B**= Paratype 2 – Trawled off Lady Elliot Island, (SH 95 mm); **C**= Paratype 3 – Trawled off Lady Elliot Island, BCC (SH 81 mm); **D**= Paratype 4 – Lady Musgrave Island ARFC no. 4886 (SH 90.8 mm); and *Relegamoria ariae* n. sp.: **E**= Paratype 1 – off northern K'gari, BCC (SH 102 mm); **F**= Paratype 2 – off northern K'gari, BCC (SH 71 mm); **G**= Paratype 3 – Lady Musgrave Island, ARFC no. 4886 (SH 99.1 mm).

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Plate 7. Comparative plate showing the variability of *Relegamoria ashleyfieldi* n. sp.: **A**= Paratype 2 - North of Pith Reef, 280-300 meters, BCC (SH 71 mm); **B**= Paratype 3 - North of Pith Reef, 280-300 meters, BCC (SH 86 mm); and **C**= Paratype 1 - North of Pith Reef, 280-300 meters, ARFC no. 5022 (SH 93.6 mm).

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Plate 8. Comparative plate showing the variability of *Relegamoria annetteae* n. sp.: **A**= Paratype 1 – trawled off K'gari, BCC (SH 97.5 mm); **B**= Paratype 2 – trawled off K'gari, BCC (SH 105 mm); **C**= Paratype 3 – trawled off K'gari, BCC (SH 82 mm); and *Relegamoria aliuamolleri* n. sp.: **D**= Paratype 1 – trawled off North Reef, CTC (50 mm); **E**= Paratype 2 – trawled off North Reef, CTC (52 mm); **F**= Paratype 3 – trawled off North Reef, CTC (50 mm); **G**= Paratype 4 – trawled Swain Reefs, CTC (54.5 mm); **H**= Paratype 5 – trawled Swain Reefs, 200 meters, VCC (45.6 mm); **I**= Paratype 6 – trawled east of Bundaberg, VCC (56.4 mm); **J**= Paratype 7 – trawled off Capricorn Group, ARFC no. 1624 (SH 45.8 mm); **K**= Paratype 8 – trawled off Lady Elliot Island, ARFC no. 1623 (SH 50 mm).

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Have a shell collection you would like to donate to The San Diego Shell Club?

The San Diego Shell Club is interested in your shell collection. As a 501c(3) organization, all donations to our Club may provide a tax write-off. When we receive a donation we provide a letter describing the items that may be used when filing your taxes. While we cannot provide a value, donations of up to $5,000 do not require a written appraisal. Since tax laws change regularly we recommend that you check with your tax accountant before relying on any information provided here.

We are interested in all types of shells, marine or land and all genera and species, including books on shells as well as items related to shells such as artwork, storage cases and tools. Your donated items will be used to generate income to support the Club's efforts in continuing Public education about shells and conservation of marine life throughout the world. If you would like to donate, please contact David Waller, SDSC Acquisition Chairperson, by email at dwaller@dbwipmg.com to schedule a time to discuss charitable gifting.

CLUB NEWS

August 2023 - On August 25th through 27th the sixth annual West Coast Shell Show took place in Balboa Park in San Diego. For more information see the article by David B. Waller on p. 296.

September 2023 - After a multi-year hiatus, the September Party returned on September 9th, hosted by Silvana Vollero and Robert Petroski. Photos of the event can be seen on the Club website in the "Picture Gallery" (under the "About Us" tab). A marvelous time was had by all!

October 2023 - On October 28th, the General Meeting featured a presentation by David P. Berschauer on "How to Prepare an Exhibit for the West Coast Shell Show" in which David outlined in easy-to-understand terms how to create anything from a simple display to a complex exhibit. A recording of the presentation can be found in the "Shell Club Presentations" section of the Club website under the "Resources" tab: https://zoom.us/rec/play/j-eLkD7Bj9Mrr4sTE-16WUCGIGZ8LqEyArrd0vo7lbdI1DY1yF7eLGAk7laW-MWYZbYLmCxH_7vAc-3J.fMMpIxBbGCCT7vO8?autoplay=true&startTime=1698519889000

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2023 West Coast Shell Show

David B. Waller

This year's West Coast Shell Show was a fabulous success. There were 6 dealers represented, over 15 exhibits that included displays representing the five most recognized families of shells presented by the San Diego Shell Club, one educational non-graded exhibit, and 10 award winning exhibits. Not all the exhibitor entries received awards of recognition, but all were award winning displays, see below.

Figure A.

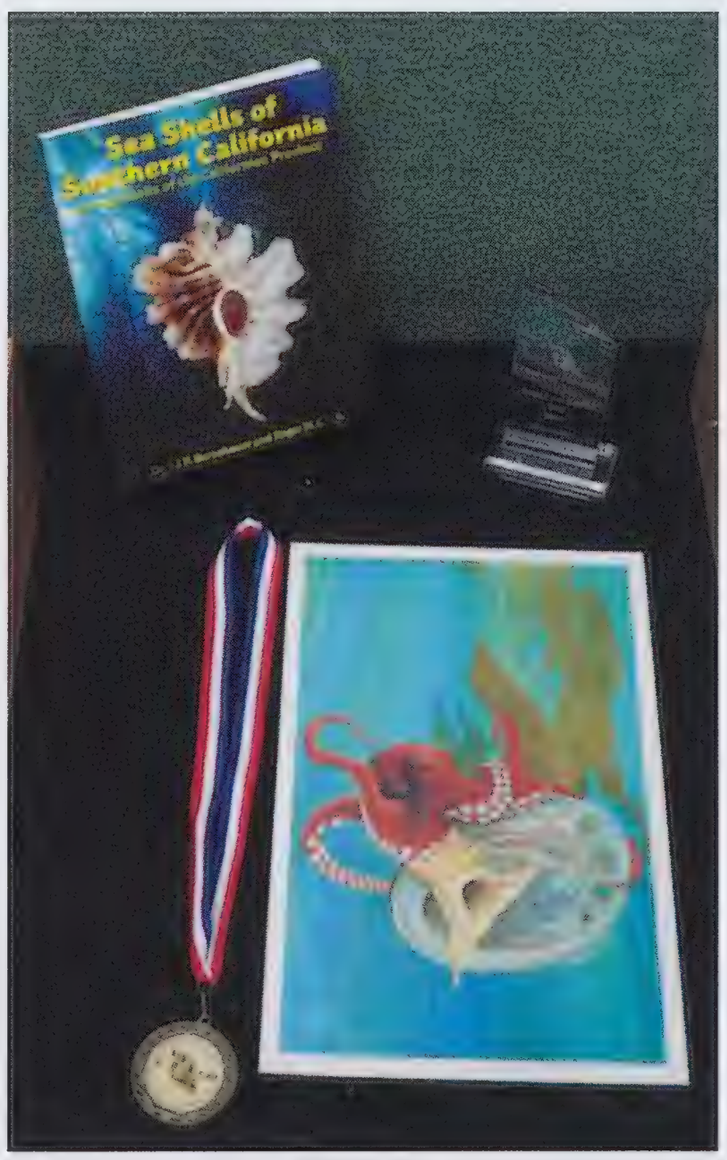

Figure B.

Figure C.

Figure D.

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Figure E.

Figure F.

Figure G.

Figure H.

Figure I.

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Figure J.

Figure K.

Figures A through K. **A**= *Chicoreus* exhibit by David Waller won "The Festivus Award", the "Wes Farmer Educational Award" and first place medal for one genus; **B & C**= California Dreamin' exhibit by David Berschauer won "Shell of the Show" (*Austrotrophon catalinensis*) and first place medal for one region; **D**= Fasciolaridae exhibit by David Berschauer won second place medal for one family, second place medal for one genus, and Judges Special Merit medal; **E**= Buccinidae exhibit by Roger Clark one "Shell of the Show self-collected" and first place medal for one family; **F**= *Argonauta* exhibit by Lisa Lindahl won first place medal for Artistic Division; **G**= Pectenidae exhibit by Lisa Lindahl won second place medal for one region; **H**= *Asperitas* exhibit by Scott Zaragosa; **I**= *Ceraesignum* exhibit by Scott Zaragosa; **J**= Cancellaridae exhibit by David Berschauer won first place medal for one family; and **K**= San Diego Sea Shells exhibit by Dr. Paul Tuskes.

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Below are some images of the bourse Tables:

Figure L.

Figure M.

Figure N.

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Figure O.

Figures L through O. **L=** shells for sale from Rob Martinson; **M=** shells for sale from Dr. Charles Hames; **N=** display cabinet of shells for sale from David Waller; and **O=** shells for sale from Philip Clover.

One of the more rare shells sold at the show was a *Siratus beauii f. branchii* (Clench 1953) sold by Rob Martinson, a *Spondylus clarksoni* (Limpus 1992) sold by David Waller, and a couple of newly found and unnamed Buccinidae sold by Roger Clark.

A special thanks to all those who visited the show and for those who took the time from their busy schedules to help with set-up and break down; Paul Tusks, Lisa Lindahl, Barney Hunhold, Roger Clark, David Berschauer, Scott Zaragosa, Chris Masiocek (photographer), and if I missed anyone, I apologize.

NOVAPEX

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Size Range of *Crassispira semiinflata* (Grant & Gale, 1931)

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Percy A. Morris, 1966, referring to *Crassispira semiinflata* as *Burchia redondoensis* (Burch), gave its geographical range as Redondo Beach, California, with a height to nearly 2 inches (50.8 mm). James H. McLean, 1978, gave the range of *C. semiinflata* from Redondo Beach, California, to Turtle Bay, central Baja California, with a height of 30-45 mm. David P. Berschauer and Roger N. Clark, 2018, gave the range from Redondo Beach, California, to central Baja California, Mexico, with a size to 40 mm. Wikipedia, noting the name *Crassispira semiinflata* may be invalid, records its range off southern California and in Baja California, Mexico, with a size between 35 and 52 mm. WoRMS, the World Register of Marine Species, as of January 2019, has given the accepted name of *semiinflata* as *Burchia semiinflata* (U.S. Grant & Gale, 1931).

The following list records the height of 66 *Crassispira semiinflata*, all collected off the Palos Verdes Peninsula of Southern California, except for one 38.6 mm specimen found at the Hermosa Beach artificial reef, just north of Redondo Beach, California, during the years of 1977 through 1983. The Palos Verdes Peninsula extends for over 26 miles from the southern end of Torrance Beach, south to San Pedro, California. Almost all of the shells were collected dead, with no preference given to size, while diving at 10 to 20 meters by the author. The largest specimen, 58.8 mm, collected off the Palos Verdes Peninsula in 1977, was the 1980 and 1987 Lost Operculum Club ("LOC") record and the 1997 through at least 2008 Registry of World Record Size Shells (WRS) record. The previous LOC record was a 53.5 mm specimen collected in 1971 at Little Harbor, Catalina Island, held and likely collected by Buzz Patterson. The 2016 WRS *C. semiinflata* record was a photographed 43.9 mm specimen collected in the U.S.A., held by G. Munshower. When two or more shells measure the same size, their number is given in parenthesis.

Crassispira semiinflata (Grant & Gale, 1931), size range from a sample of 66:

58.8 mm	52.8 (2)	50.9	48.7 (2)	43.5
56.7	52.4	50.6	48.2	42.6
55.7	52.2	50.2	47.6	41.6 (2)
55.1	52.0 (3)	50.1	46.8	41.3
54.9	51.8 (2)	49.7	46.4	40.9
54.2 (2)	51.7	49.5	46.2	40.6
53.9 (2)	51.6	49.4	45.0	40.5
53.8	51.4 (2)	49.3	44.9	39.2
53.7	51.2 (2)	49.2 (3)	44.7	38.6
52.9	51.0 (4)	49.1	43.6	38.5
				37.0

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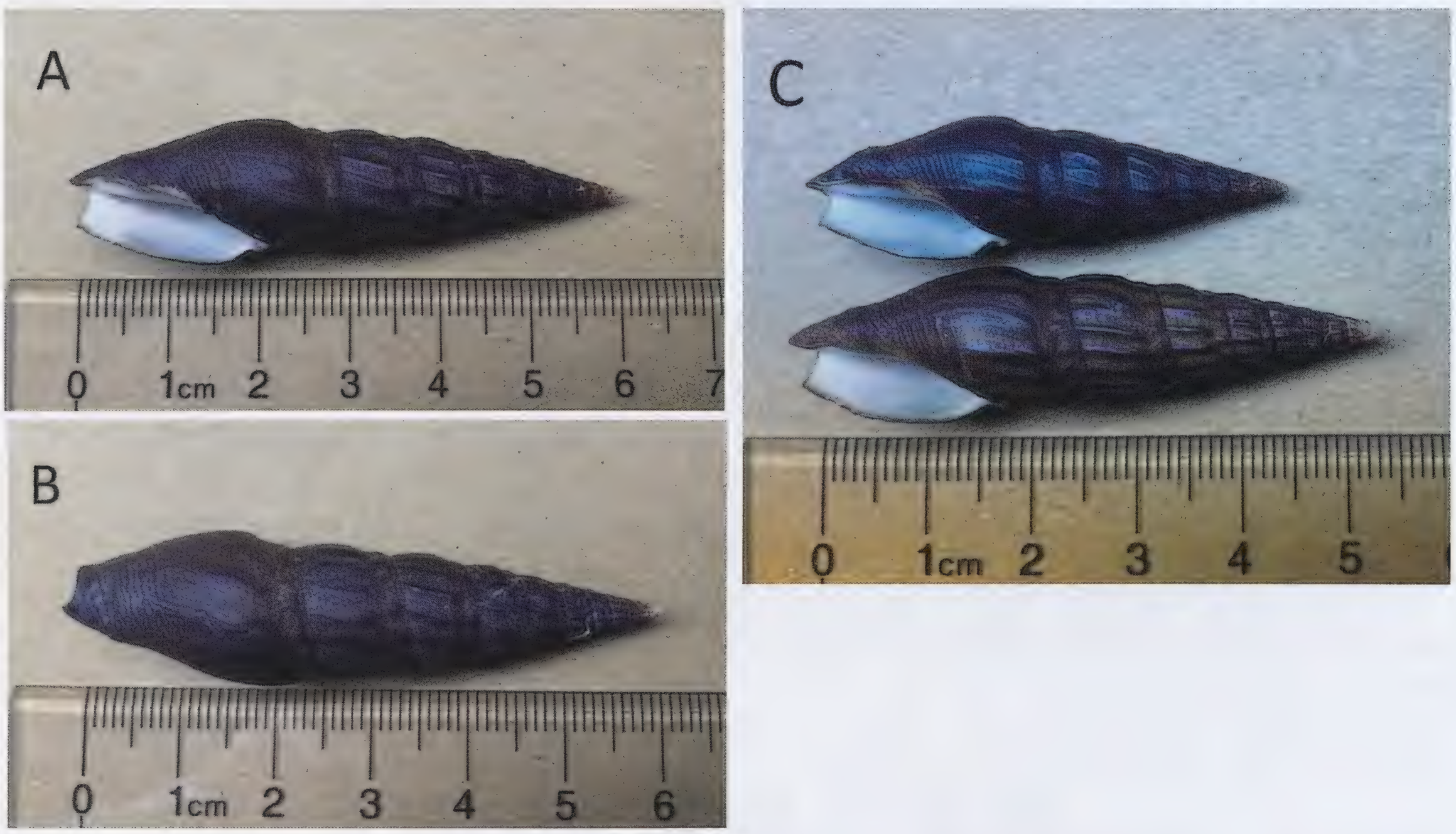

Figure 1. *Crassispira semiinflata* (Grant & Gale, 1931). **A**= 58.8 mm, Palos Verdes, California; **B**= 58.8 mm, Palos Verdes, California; **C**= 54.2 and 43.6 mm, Palos Verdes, California. Photos taken with an iPhone 12 by Paul Stillians adjacent to a ruler with millimeter markings.

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In Memoriam
Joyce Gemmell (1924-2023)

After a brief illness, Joyce Gemmell passed away in El Cajon on 22 September 2023.

While living in San Felipe, Mexico, during the 1970s, she had amassed a large collection of mollusks and with her husband Bill hosted many SDSC members on field trips to their home on the Gulf of California. Moving to the San Diego region, Joyce worked with Carole Hertz, Barbara Myers and Tony D'Attilio at the San Diego Museum of Natural History, researching her collection and publishing numerous articles in *The Festivus*. She spent the final decades of her life working with the Master Gardener Association as a horticulturist consultant and lecturer.

A biblio-biography of Joyce Gemmell's work and life will be published in an upcoming issue of *The Festivus*.

Rest in Peace, Joyce.

by Hans Bertsch

Figure 1. Left to right: June Kantor, Carole Hertz, Barbara Myers, Anthony D'Attilio, June King, and Joyce Gemmell. Inside the Department of Marine Invertebrates, San Diego Natural History Museum (undated). Photo from the collection of Joyce Gemmell.

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A Pacific Crown Conch (*Melongena patula*) in California?

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For the past several years I've been helping Nancy Caruso and her non-profit organization 'Get Inspired' to assess the populations of green abalones *Haliotis fulgens* (Philippi, 1845) and pismo clams *Tivela stultorum* (Mawe, 1823) in Orange County, California. Teams of volunteers rake parallel transects for pismo clams to assess the pismo clam population during extreme negative low tides of each year with an effort to rake all of the sandy beaches in the county.

In late January 2023, we raked from Newport Pier in Newport Beach north toward the Santa Ana River mouth, surveying between a series of eight finger jetties that protrude 50 to 100 m (165 to 238 ft.) off this sandy beach. Because both pismos and abalones have been appearing in unexpected places, I've taken to checking even the most marginal-seeming habitat for these mollusks. After completing our planned pismo clam survey area for the day, I used the remainder of the negative low tide to look for abalones in the rip-rap of the 52nd Street Jetty which was our transect's endpoint for the day. Towards the end of the jetty, in a rather deep hole among the rip-rap boulders, I was shocked to see a large gastropod wedged between rocks at the base of the jetty that I couldn't immediately identify.

I own Grey Owl Biological Consulting, and it is my business as well as my passion to search for rare or out-of-place species. I keep catalogs of local species in my head to compare against critters heard or seen in the wild. When surveying familiar habitats, I keep a mental picture of what I expect to see or hear and let the sight or call of unexpected or target species trigger my attention. So looking down at this strange shell that was neither in my mental catalog nor in my California shell books was an absolute shock!

I took it home, cleaned a couple of small encrusting worm tubes off the inside of the shell, and used wider-ranging guides to identify it as a Pacific crown conch *Melongena patula* (Broderip & G. B. Sowerby I, 1829). It measures 130 mm (5 1/8 in) long, 75 mm (3 in) tall, and 98 mm (3 7/8 in) wide, so it was an adult specimen of the species (Figures 1 - 3). The closest reported occurrence that I could find for this species in online museum inventories was inside the northern entrance of Magdalena Bay near the tip of the Baja California peninsula about 1,185 km (736 miles) to the south. How did one become lodged in a Newport Beach finger jetty?

This is a public beach, but it's over a kilometer and a half (1 mile) walk to 52nd Street Jetty from large parking lots at the Santa Ana River Mouth to the north or Newport Pier to the south. Private homes and apartments line the beach but this is not an area where people flock to walk on the beach. The 50 meter-long 52nd Street Jetty is actually the shortest of the 8 finger jetties, so it's not a jetty used by fishermen; you can walk around then end of the jetty during a minus low tide. It's not a dive

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location and the bottom there is often stirred up. It's not a beach frequented by tourists. The 52nd Street Jetty is not near a harbor where the shell might have fallen off a boat. It's unlikely that this shell was purposely brought to that location.

Figures 1 to 3. *Melongena patula* (Broderip & G. B. Sowerby I, 1829) measuring 130 mm in length: Figure 1 = top left; Figure 2= top right; Figure 3=bottom.

This species typically occupies shallow soft bottoms, so the shell lodged in the jetty was not transported from deep water by waves. The shallows around the collection site seems unremarkable compared with habitat up and down the immediate coast and there are no estuary openings close by.

An important question was what is the farthest north where a living Pacific Crown Conch has been recorded? Magdalena Bay was the easy answer, however, some reputable websites listing museum collections around the world indicated "California" as the collection location for a few *Melongena patula* specimens. Rather than simply discount those records as being in error, I went a bit down the

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rabbit hole and contacted curators at several museums across the United States and in other countries where specimens from "California" were reported. I asked the curators if they would look at the specimens in question and read their original labels. Without exception, collections managers across the globe were very responsive and helpful. I often received back a cell phone photo of the shell showing the original label and often accompanied by a photo of the original museum ledger page where the specimen was recorded. A few specimens proved to be fossils collected in California but were not listed as fossils online. One specimen listed as being from “California” was actually from Baja California, but the word “Baja” had been omitted when the record was digitized. Another museum specimen labeled as being a from California had been purchased along with a large number of other shells from a shell dealer in another country, and the location “Baja California” had been translated to simply “California”. I eventually heard back from all of the curators who I had contacted, climbed back out of the rabbit hole, and ended my search. I am very thankful to all of the curators across the globe who quickly acted to answer the random query of a California biologist who they didn't know. I could find no verifiable record of a contemporary specimen having been found in California.

There are precedents for living southern shell species thought restricted to the Gulf of California and farther south to be found in Southern California. A living black murex (*Muricanthus nigritus*) found at Bird Rock, La Jolla, and 4 pink-mouth murex (*Phyllonotus erythrostomus*) are "Gulf" species that were found alive in San Diego. This is just a suggestion ... a lot of southern fish species invaded our area and some stayed for several years during the El Ninos and particularly when an El Nino turned into "The Blob" from about 2015 to 2017. There was a *strong* 6-knot surface current that raged up the coast to at least the northern Channel Islands for two months that had me pushing my boat throttle forward to compensate when I turned down coast. I can imagine that a LOT of southern larvae rode that river north into California. Did some of those mollusk larvae live long enough to become mature?

I found this shell dead, so I cannot prove that the shell lived on the sandy bottom near this finger jetty in Newport Beach. This mollusk is typically found on soft bottoms, often in mangrove lagoons. We have no mangroves here, but I plan to make some dives on the sand flats in front of that jetty, perhaps after a multi-day Santa Ana wind from shore flattens and clears the water. I invite you to look there as well if you are in the area. The more you look the more you find!

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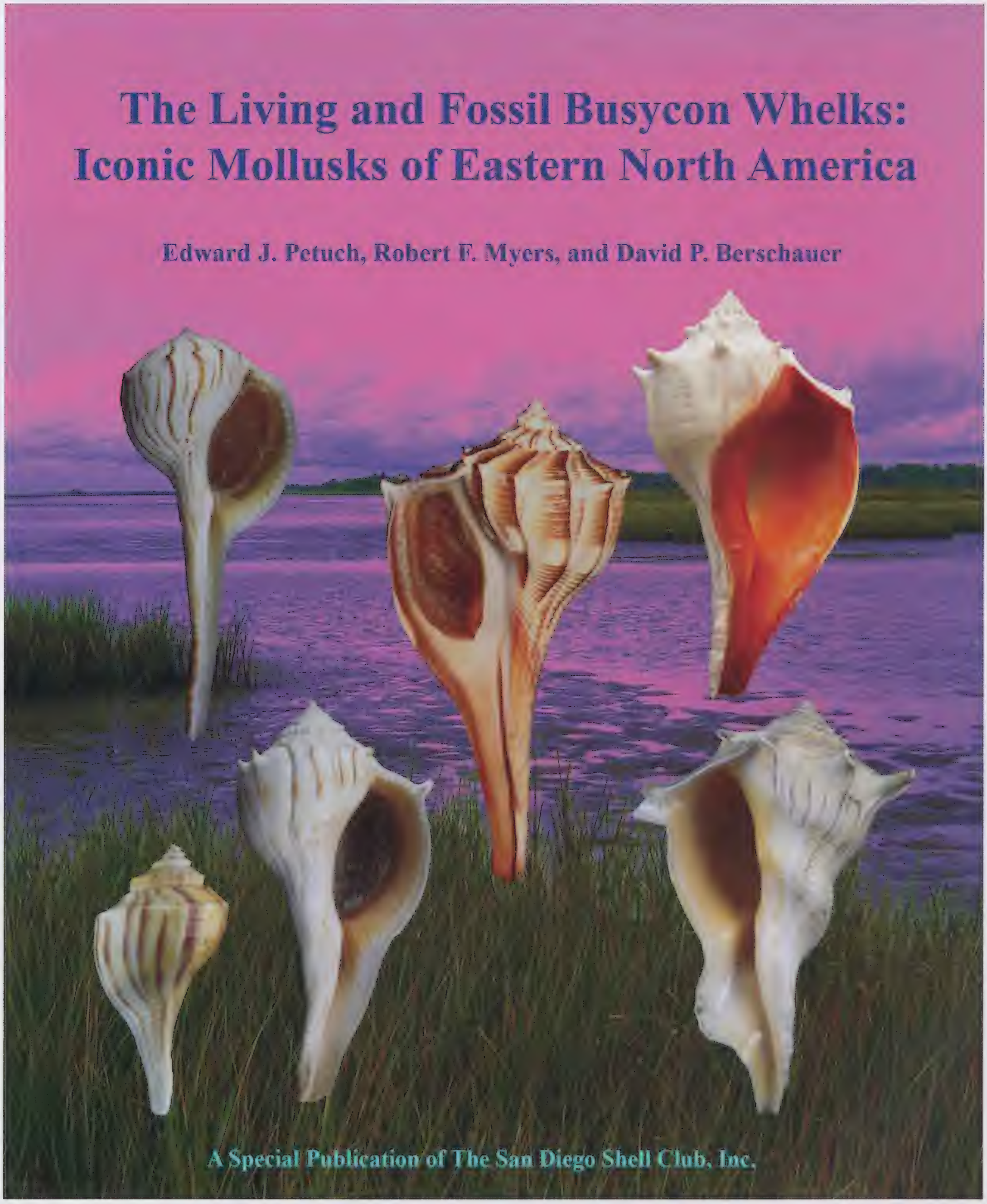
The Living and Fossil Busycon Whelks:
Iconic Mollusks of Eastern North America
Edward J. Petuch, Robert F. Myers, and David P. Berschauer
A Special Publication of The San Diego Shell Club, Inc.

Back by popular demand in hardbound edition. This book presents a taxonomic revision of the "Busycon whelks" with detailed information on 6 living and 8 extinct genera belonging to 4 subfamilies, and 17 recent and 112 fossil species, together with distribution maps and over 100 color figures. Priced at $100.00 plus tax and shipping costs. Third Printing.

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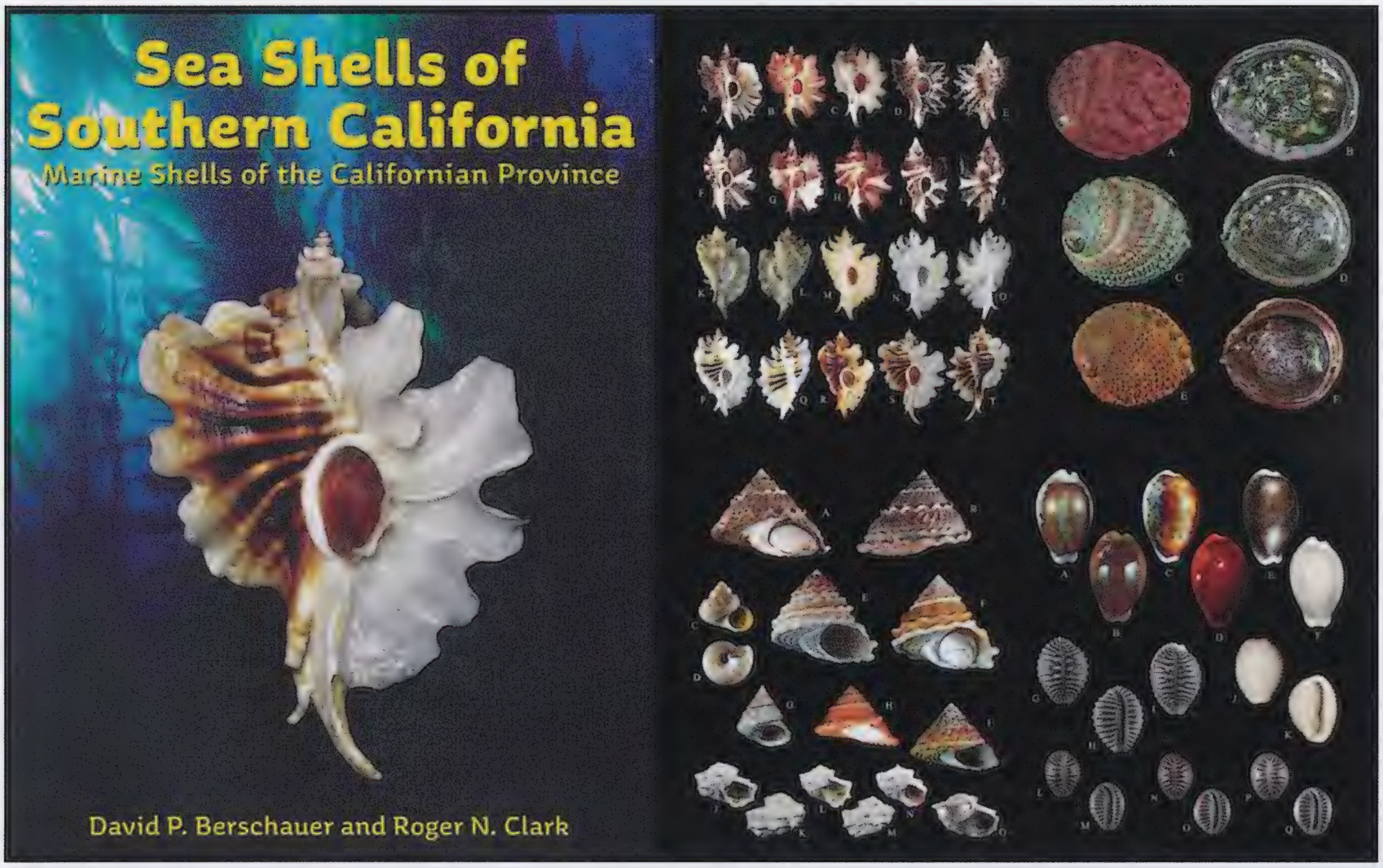

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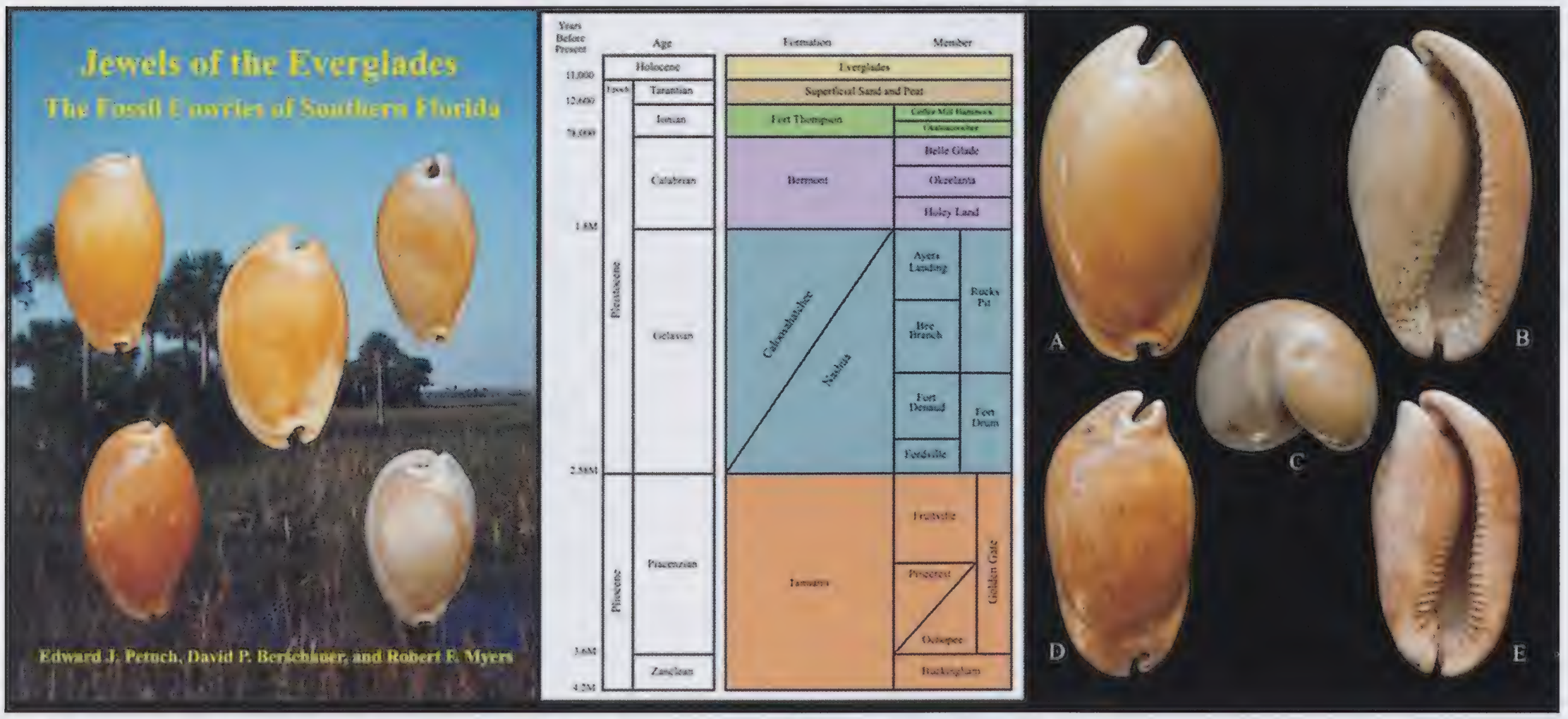

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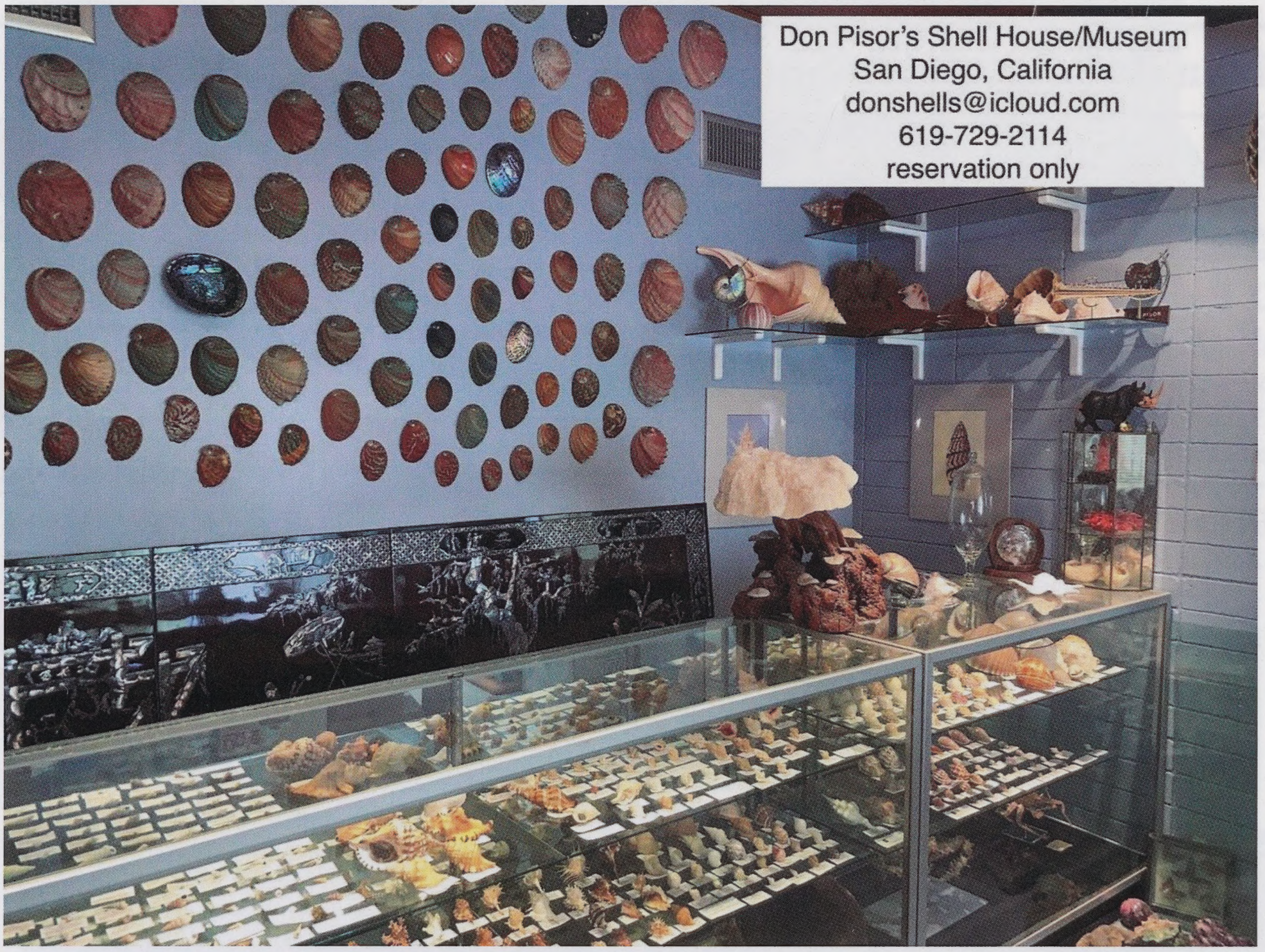

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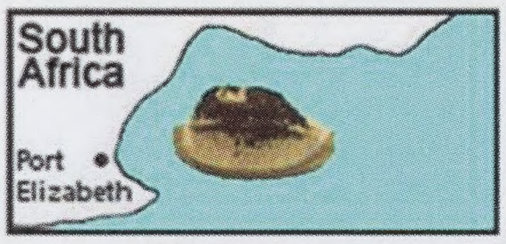

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Back cover: Some new species from the Gulf of Mexico: *Conomodulus lambi* Petuch & Berschauer, 2023; *Trochomodulus velai* Petuch & Berschauer, 2023; *Cinctura salasi* Petuch & Berschauer, 2023; *Lindafulgur camazotz* Petuch & Berschauer, 2023; *Scaphella (Clenchina) carrieae* Petuch & Berschauer, 2023; *Scaphella (Clenchina) rundoi* Petuch & Berschauer, 2023; *Ventrilia jonathoni* Petuch & Berschauer, 2023; *Ventrilia xbalanque* Petuch & Berschauer, 2023; *Bulla occidentalis morai* Petuch & Berschauer, 2023. (Cover artistic credit: Rex Stilwill).

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